Checking the status of cooling of fuel debris at Fukushima Daiichi Nuclear Power Station Unit 2

<Reference>
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- Currently, cooling water is being injected in a stable manner into the reactors of Units 1-3 and as time passes the decay heat given off by fuel debris that melted and fell during the accident has greatly decreased.

- Meanwhile, when assessing temperature changes in the event that the injection of cooling water into the reactors were to stop, calculations are made while only considering the decay heat from fuel debris and not temperature decreases caused by the natural dissipation of heat into the air that is actually occurring.

- In light of these circumstances, TEPCO has decided to temporarily either reduce or stop the injection of cooling water into the reactors in order to ascertain the actual cooling status of fuel debris and examine the accuracy of temperature change assessments (heat balance assessments) under conditions that more closely resemble the actual situation and consider the dissipation of heat into the air.

- The first test will be performed at the beginning of next year after preparations have been completed at Unit 2 where measurements can be taken reliably using temperature gauges that were installed at the bottom of the reactor pressure vessel (RPV) and in the primary containment vessel (PCV) after the accident.

- If this new heat balance assessment yields results that show that the situation is indeed much more subdued than currently implemented assessments indicate, employing it going forward will enable further improvements, such as optimization of emergency response procedures.

The objective of checking the cooling status of fuel debris

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① Optimizing emergency response procedures

By ascertaining temperature changes under more realistic conditions (shortening time divergence), it will be possible to revise repair procedures so that they are more optimal thereby enabling more urgent responses to be focused on in the event that reactor cooling shuts down and multiple troubles occur.

	Temperature increase rate	Time*2 until RPV temperature reaches 80°C*1
Current assessment	Approx. 5℃/hour	Approx. 10 hours
Heat balance assessment	Approx. 0.2℃/hour	Approx. 12 days

*1 Limiting conditions of operation in the implementation plan
*2 If the initial temperature is approximately 30°C

② Improving operation and maintenance management

It is expected that operation/maintenance can be improved (human error risk reduction, etc.) to the point where complicated operations required to minimize cooling water volume changes during reactor cooling water injection equipment pump switchover, etc., can be simplified to the point where one merely needs to start the other pump after the first one is shut off.

【Reference】

In light of the fact that Units 1-3 spent fuel pool water temperature assessments were conducted between July and October 2017 when cooling was shut down, from February 1, 2018 the assessment method was changed from only an assessment of decay heat to a heat balance assessment.

Method for checking cooling status
STEP1: Cut cooling water volume in half

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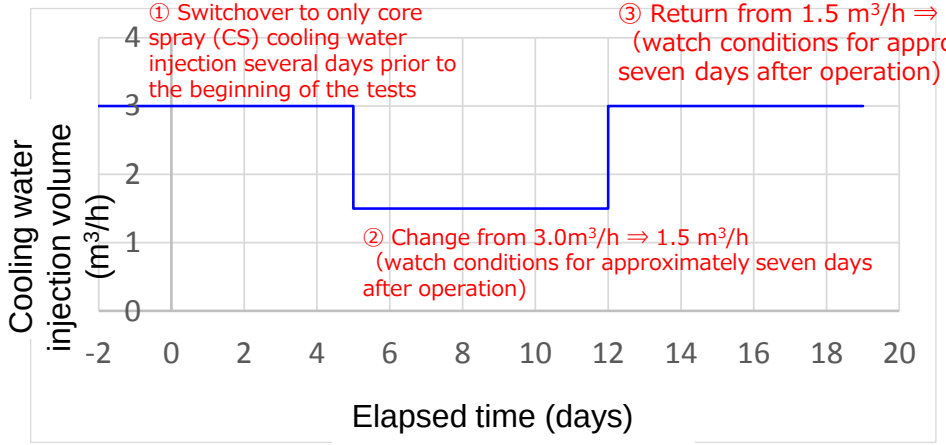
【STEP1 overview】

- The cooling status of fuel debris will be checked first* at Unit 2 where measurements can be taken reliably using temperature gauges that were installed at the bottom of the reactor pressure vessel (RPV) and in the primary containment vessel (PCV) after the accident
  ＊: Additional tests at other units will be planned based on the test results at Unit 2.
- Firstly, during STEP 1, the volume of cooling water will be cut in half to 1.5 m³/hour (currently approximately 3.0 m³/hour) and conditions will be watched for approximately seven days.
- After conditions with half of the cooling water volume have been watched, cooling water flow will be immediately returned to 3.0 m³/hour and conditions watched for approximately seven days.

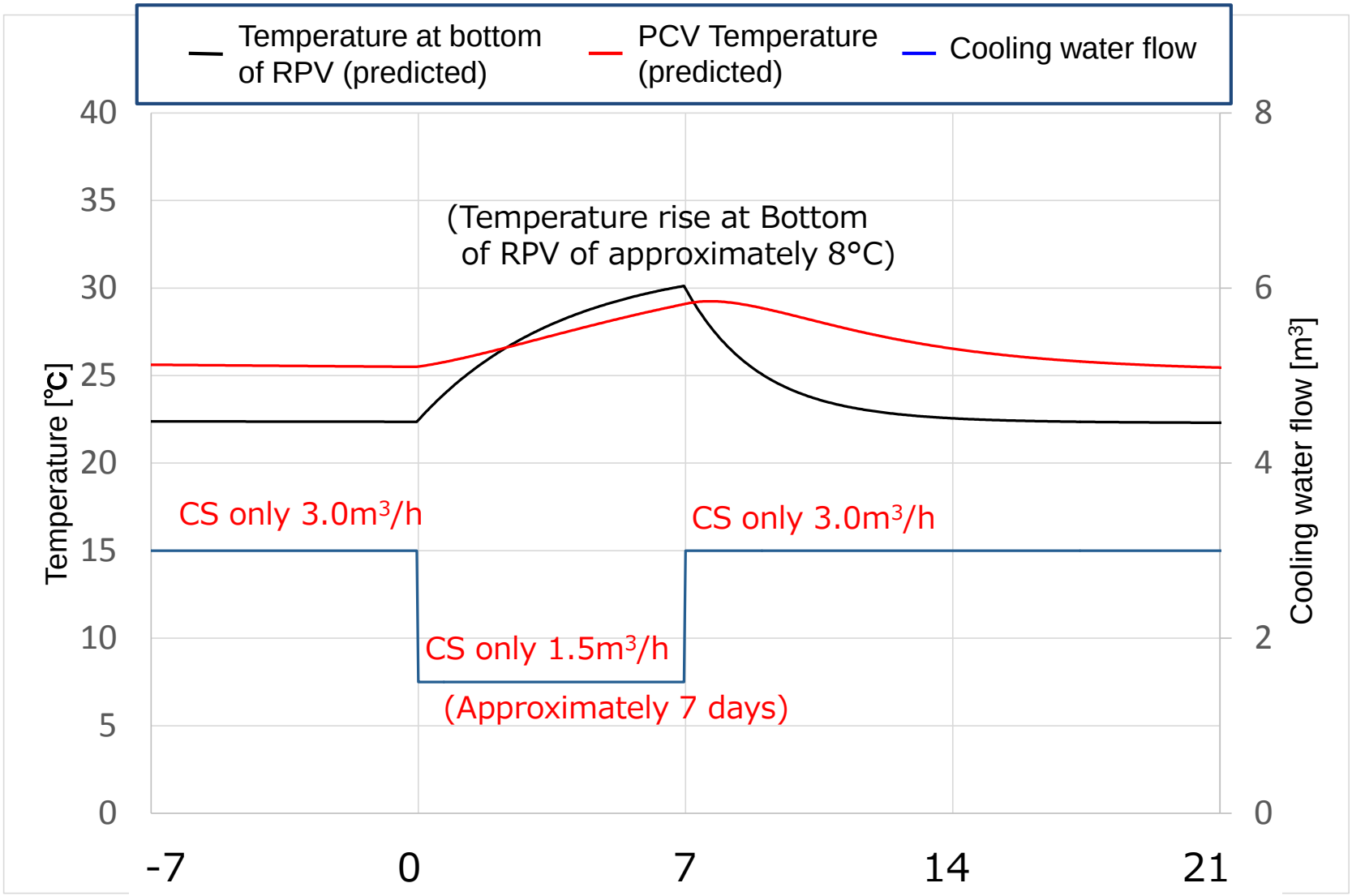
※During STEP 1, the following required safety measures will be taken in advance since the "cooling water volume increase range of 1.0 m³/hour per 24 hours," which is a limiting condition of operation noted in the implementation plan, will be intentionally exceeded.

※Safety measures that must be implemented in advance

- Monitoring of subcriticality using gas management equipment noble gas monitors
- Boric acid solution injection preparations
- Injection of boric acid solution if a significant amount of xenon 135 is detected



Reference: STEP 1 temperature behavior predictions (heat balance assessment)



Method for checking cooling status
STEP 2 : Shutdown of cooling water injection

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【STEP 2 overview】

- During STEP 2, reactor cooling water injection will be shut down and conditions watched for approximately seven hours.
- After the impact of the shutdown of the reactor cooling water injection has concluded (approximately seven hours), cooling water injection flow will be returned to 1.5 m³/hour as checked during STEP 1. Thereafter flow will be increased by 0.5 m³/hour every 24 hours until it is returned to 3.0 m³/hour, and conditions will be watched for approximately seven days.

※During STEP 2, the following required safety measures shall be implemented in advance since the limiting conditions of operation in the implementation plan that stipulate "①required cooling water injection volume of 1.1 m³/hour to cool the reactor (winter assessment value)," and② "cooling water volume increase range of 1.0 m³/hour per 24 hours," will be intentionally violated.

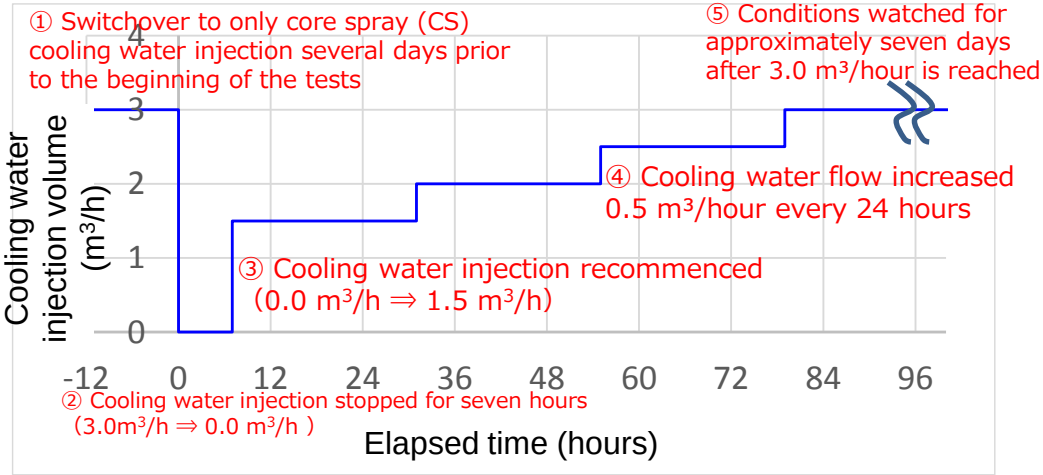
※ Safety measures that must be implemented in advance

①

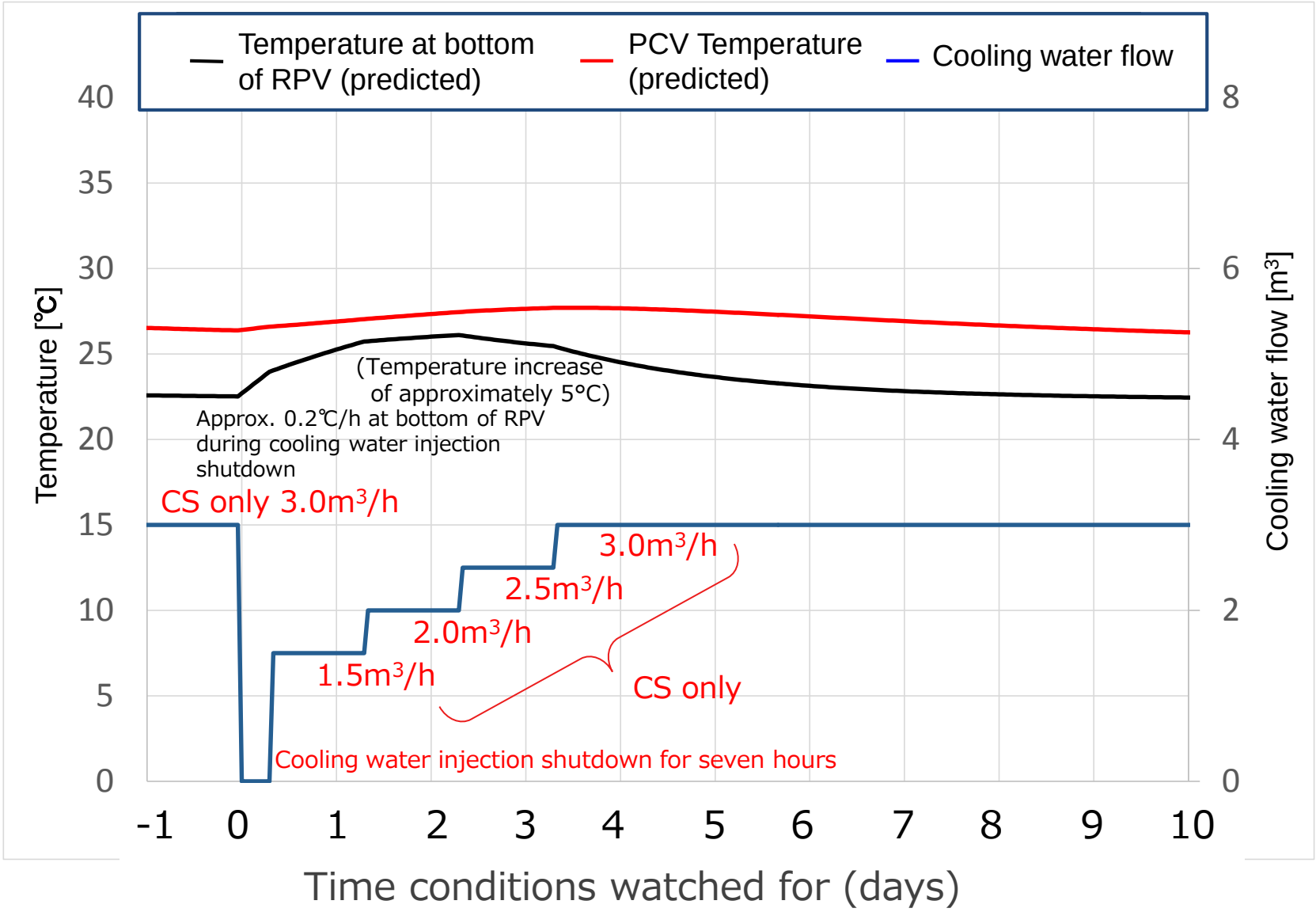
- Monitoring of temperatures in the reactor pressure vessel and primary containment vessel
- Cooling water injection flow increase by 15℃ temperature rise

②

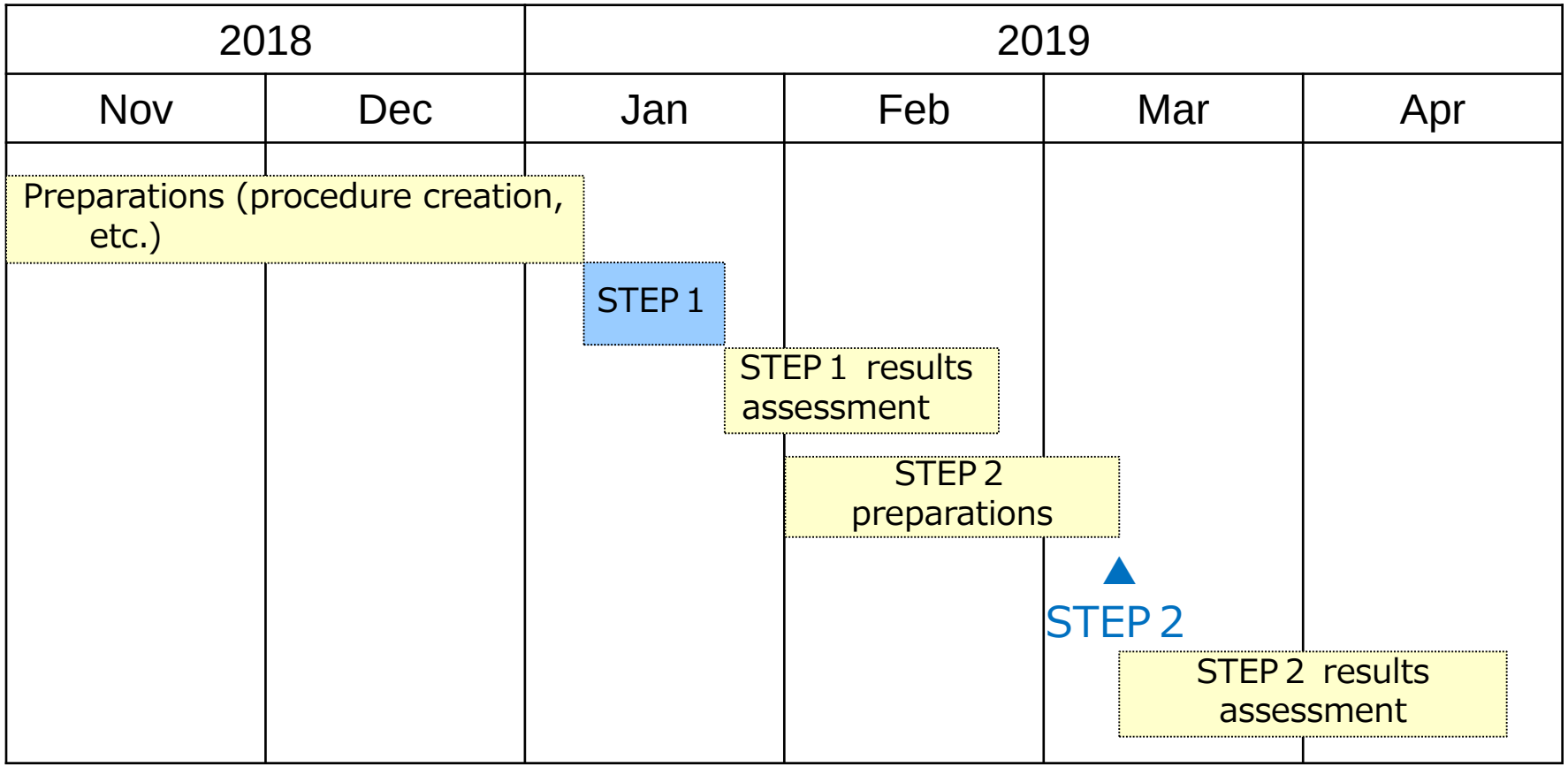
- Monitoring of subcriticality using gas management equipment noble gas monitors
- Boric acid solution injection preparations
- Injection of boric acid solution if a significant amount of xenon 135 is detected



Reference: STEP 2 temperature behavior predictions (heat balance assessment)



Planned schedule for checking cooling status



Schedule may be adjusted in accordance with plant conditions