Hydro-Québec
TRIENNIAL REVIEW OF RESOURCE ADEQUACY

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A.2.2 Unit Unavailability Factors

A.2.2.1 Types of Unavailability Factors Represented

- Forced Outages Rates

The basic generating unit parameter used in a conventional reliability evaluation is the unit forced outage rate (FOR). The FOR serves as an estimate of the probability that a generating unit will be unavailable due to forced outage at some time in the future.

Forced Outage Rate:

$$\text{FOR} = \frac{\text{Time on Forced Outage}}{\text{Time on Forced Outage} + \text{Time on Service}}$$

As illustrated in Table A-3, the typical FOR of existing hydraulic equipment are between 1.1% and 4.8% depending on the season and the "maturity" of the units.

Table A-3
Typical Forced Outages Rates[7]

Type of equipment	Forced Outage rate
Hydraulic	1.1% to 4.8%
Thermal, including nuclear	4% to 10%

- Maintenance

Typical monthly percentage maintenance for Hydroelectric Capacity figures on Table A-4. The percentage is applied on the total hydro capacity available (except Beauharnois and Les Cèdres).

Hydro-Québec continues to review its maintenance practices with the aim of extending generating unit availability.

[7] Beauharnois, Les Cèdres and Carillon are not modelled according to these FOR as described in section A.4.

Table A-4
Typical % Maintenance for Hydro Units

Month	**Maintenance for the year 2005-06**
January	0.4
February	0.4
March	4.4
April	13.7
May	17.7
June	22.5
July	24.9
August	17.1
September	21.6
October	10.5
November	5.3
December	0.4

Thermal power plants are on maintenance during summer, each powerhouse has its own maintenance schedule.

A.2.2.2 Source of Unavailability Factors Represented

The forecast of reliability indices is based on the operational history of the generating units modified pursuant Hydro-Québec quality objective on generating units and the updated Scheduled Outage.

A.2.2.3 Maturity Considerations

The reliability model accounts for maturing units. Forced outage rates of new units are higher for the first three years.

A.2.2.4 Tabulation of Typical Unavailability Factors

Typical forecast unavailability factors for different type of generating units are contained in Table A-3 and Table A-4 shown above.