New York ISO
Independent System Operator

Resource Capability Testing

Amount of Capacity Available

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Intermediate ICAP Course

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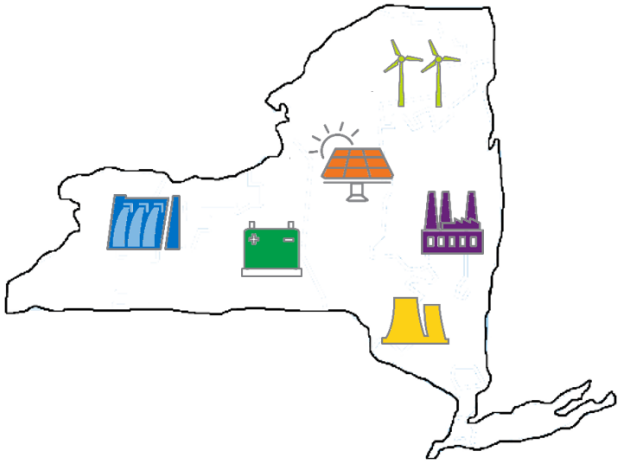
Topics of Discussion

- Concept and Purpose behind Resource Capability
- Resource Capability Testing Requirements
- Scheduling Resource Capability Testing
- Resource Specific Test Conditions
- Submitting Capability Period Test Data
- Failure to Comply with Testing & Submission Requirements

Topic 1:
Concept & Purpose behind Resource Capability

Resource Capability

- Represents amount of Capacity Available
- Suppliers provide data to demonstrate their capability to produce a given number of MWs
- Resource Capability determined by Resource Type based on one of the following:
  - Resource Nameplate
  - Actual Production Data
  - DMNC / DMGC Test
  - Performance Test



**Refer to ICAP Manual for details*

Resource Capability Test Data (or Equivalent)

- **Validated by NYISO and used:**
  - To calculate ICAP and Unforced Capacity (UCAP) value
  - For Outage Scheduling
  - In interconnection and reliability studies
  - By Transmission Owners

Resource Capability

Types of Capacity Resources

- Generators, System Resource and Control Area System Resource
- Energy Limited Resource (ELR) and Capacity Limited Resource (CLR)
- Energy Storage Resources (ESR)
- Intermittent Power Resource (Wind, Solar, Landfill Gas)
- Hydro Resource
- Limited Control Run-of-River Hydro Resource (LCRoR)
- Behind-the-Meter Net Generation Resource (BTM:NG)
- Special Case Resource (SCR)
- Resources with an Energy Duration Limitations (EDL)
- Co-located Storage Resources (CSR)

Topic 2:
Resource Capability Testing Requirements

Resource Capability Test Requirements

- **Perform Capability Tests or Submit Data from Actual Operation of Resources**
  - Every Capability Period
  - Applied to next like Capability Period
  - Can be used to update Installed Capacity rating during current Capability Period
  - Test may be DMNC, DMGC or Performance Test

DMNC Defined

- **Dependable Maximum Net Capability (DMNC)**
  - The sustained maximum net output of a Generator, as demonstrated by the performance of a test or from actual operation, averaged over a continuous time period as defined in the ISO Procedures.

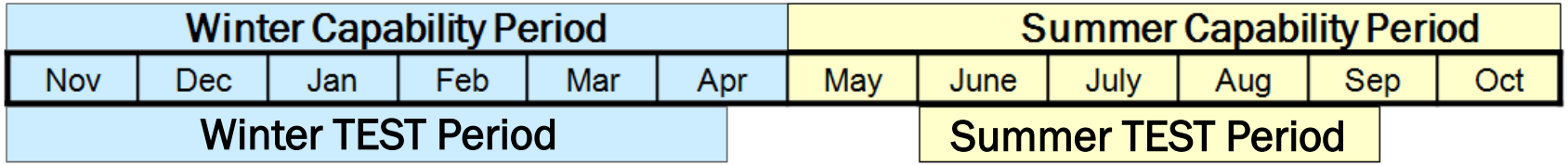
**Market Administration and Control Area Service Tariff (MST) Section 2.4*

DMGC Defined

- **Dependable Maximum Gross Capability (DMGC)**
  - The sustained maximum output of the Generator of a BTM:NG Resource, as demonstrated by the performance of a test or through actual operation, averaged over a continuous time period
- **All of the same procedures that apply to DMNC also apply to DMGC as discussed in the upcoming slides**
  - ICAP Manual Section 4.2

**Market Administration and Control Area Service Tariff (MST) Section 2.4*

Test Requirements



- Conduct test during applicable Capability Period test window
  - Summer – June 1 to Sept 15
  - Winter – Nov 1 to Apr 15
  - Tests outside these periods are only permitted if in accordance with the ICAP Manual 4.2 for "out-of-period" tests
- A generator may perform additional tests during the Test Period
- All tests must be approved by NYISO
- Operating configuration during test
  - Use same operating configuration and fuel mix that would be used during peak load conditions for Summer and Winter
- Exceptions to these test periods are Special Case Resources - see next slide

Test Requirements - SCRs

- **Each SCR is required by the NYISO to demonstrate its maximum enrolled megawatt value once in every Capability Period**
  - NYISO will accept as evidence of such demonstration the higher of its greatest load reduction either in a mandatory event hour or in a first performance test hour
- **Performance test period for SCRs are determined by NYISO as follows:**

Summer Capability Test Period
Performance test in hours that correspond to the time boundaries of the Capability Period SCR Load Zone Peak Hours
Aug 15 - Sept 7

Winter Capability Test Period
Performance test in hours that include one (1) hour before and one (1) hour after the actual hours included in the Capability Period SCR Load Zone Peak Hours, for that Winter Capability Period, not to exceed the time boundaries of the Capability Period SCR Load Zone Peak Hours
Feb 15 - Mar 3

  - In addition to demonstrating its maximum enrolled megawatt value once in every Capability Period as described above, a SCR enrolled with an Incremental ACL or a SCR Change of Status may also be required to perform in the second performance test in the Capability Period

**Refer to the ICAP Manual Section 4.12.4 for additional details*

Topic 3:
Scheduling Resource Capability Testing

Scheduling DMNC/DMGC Tests

Notify NYISO Scheduling and the Transmission Owner (TO) accordingly:

- **For Units >100 MW**
  - At least 5 business days advanced notification required
  - Must bid hours for test in DAM
    - If not scheduled – Test is canceled—notify NYISO and the TO by 1400 hours day before
- **For Units > 25 MW and <99 MW**
  - At least 2 business days advanced notification required
  - DAM bid not required, but must be scheduled by RTC
- **For Units < 25 MW**
  - No advanced notification requirement

**Transmission and Dispatching Operations Manual Section 5.7.5*

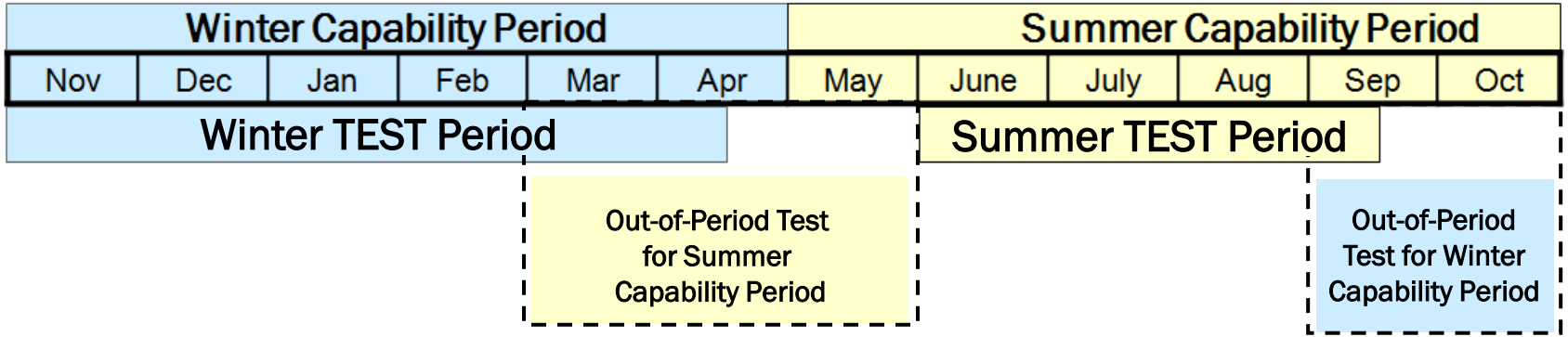
Test Day Obligations

- **Resources performing DMNC/DMGC test**
  - At least 3 hours prior to scheduled test, generator must request permission to start test from NYISO through Transmission Owner (TO)
  - Ensure RT hours are scheduled for test
  - Adjust RT bid to allow RT Dispatch (RTD) to schedule Generator to DMNC/DMGC rating
  - Notify NYISO, through TO, when the test has started and completed
- **For SCRs, NYISO shall provide at least 2 hours notice that the SCR's performance will be required**
  - Refer to ICAP Manual Sections 4.12.4 and 4.12.5

In Test Details

- **Energy provided by Generator during test**
  - If scheduled in DAM
    - May be covered by Bid Production Cost Guarantee, if eligible
  - If scheduled in Real Time
    - Paid Real Time LBMP
- **If Generator suspects it will not get an energy schedule, it may request Out-of-Merit to perform tests**
  - Refer to NYISO Accounting and Billing Manual; Section 5, Appendix C and the Transmission and Dispatching Operations Manual Section 5.7.5

Out-of-Period (OOP) DMNC/DMGC Test



- **To begin next Capability Period**
  - Summer: Test data from after 3/1 and prior to 6/1
  - Winter: Test data from after 9/1 and prior to 11/1
- **The OOP test must be verified with equal or greater test result within the next Test Period or penalties may apply**

Topic 4:
Resource Specific Test Conditions

Resource Specific Test Conditions

- **Resource specific test conditions are identified and summarized by resource type in the following slides**
  - For details, ICAP Manual Section 4.2.2

- **Test results are net of any station service load – for all resources**
  - For details, ICAP Manual Section 4.2.3

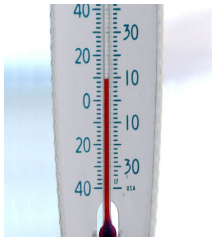
Resource Specific Test Conditions

- **Criteria for Fossil Fuel and Nuclear Stations**
  - Sustained maximum net output for 4 consecutive hours
    - Integrated hourly average at top of each hour
- **Criteria for Hydro Stations (except for LCRoR)**
  - Sustained net output averaged for 4 consecutive hours (top-of-hour to top-of-hour)
    - Uses average stream flow and/or storage conditions within machine discharge Capacity

**Refer to ICAP Manual Section 4.2.2*

Resource Specific Test Conditions

- **Criteria for Combined Cycle Stations**
  - Sustained maximum net output for 4 consecutive hours
    - Integrated hourly average at top of each hour
  - Corrected for temperature
    - Average ambient temperature at time of Transmission District's peak during previous 4 like capability periods excluding the shoulder months
      - For Winter: exclude November and April
      - For Summer: exclude May and October
    - Temperature from approved weather station or auditable recording device at the generator site

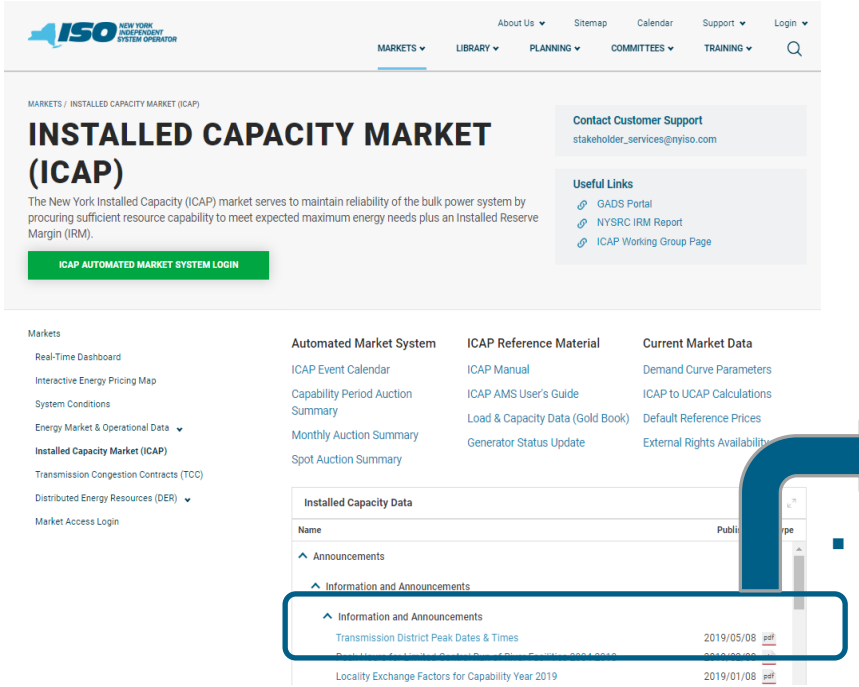


**Refer to ICAP Manual Section 4.2.2*

Average Ambient Temperature

Transmission District Winter and Summer Peak Dates

Posted on NYISO Web Site: https://www.nyiso.com/installed-capacity-market



Winter Capability Period

Dec 1 - Mar 30	Central Hudson		Consolidated Edison		Long Island PA	
	Date	Hour Ended	Date	Hour Ended	Date	Hour Ended
1996 -1997	1/17/1997	18	1/9/1997	18	1/17/1997	19
1997 -1998	12/10/1997	18	3/31/1998	17	1/28/1998	18
1998 -1999	1/14/1999	18	1/14/1999	18	1/14/1999	18
1999 -2000	1/17/2000	19	1/18/2000	18	1/17/2000	19
2000 -2001	1/2/2001	19	12/6/2000	18	12/28/2000	19
2001 -2002	1/2/2002	17	1/3/2002	18	1/2/2002	19
2002 -2003	1/23/03, 1/27/03	19	1/23/2003	18	1/27/2003	19
2003 -2004	1/15/2004	19	1/15/2004	18	1/15/2004	19
2004 -2005	12/20/2004	19	12/20/2004	18	12/20/2004	19
2005 -2006	12/14/2005	19	12/14/2005	18	12/14/2005	19
2006 -2007	2/5/2007	19	2/5/2007	19	2/5/2007	19
2007 -2008	1/3/2008	19	1/3/2008	18	1/3/2008	19
2008-2009	12/19/2008	18	12/22/2008	18	12/22/2008	19
2009-2010	12/29/2009	18	1/4/2010	18	12/29/2009	19
2010-2011	1/24/2011	19	12/15/2010	18	12/15/2010	19
2011-2012	1/21/2012	18	1/4/2012	18	1/3/2012	19
2012-2013	1/24/2013	19	1/23/2013	18	1/23/2013	19
2013-2014	1/7/2014	19	1/7/2014	18	1/7/2014	19
2014-2015	1/7/2015	19	1/8/2015	18	1/7/2015	19
2015-2016	2/15/2016	19	1/19/2016	18	1/4/2016	19
2016-2017	12/15/2016	18	1/9/2017	18	12/15/2016	19
2017-2018	1/6/2018	19	1/5/2018	18	1/5/2018	19

These are the dates and times of each Transmission District's peak load grouped by Summer/Winter Capability periods

- Use previous 4 like capability periods excluding the shoulder months

Resource Specific Test Conditions

- **Criteria for Combustion Resources**
  - Sustained maximum net output for 1 hour (top-of-hour to top-of-hour)
  - Corrected for temperature
    - Average ambient temperature at time of Transmission District's peak during previous 4 like capability periods excluding the shoulder months
      - For Winter: exclude November and April
      - For Summer: exclude May and October
    - Temperature from approved weather station or auditable recording device at the generator site

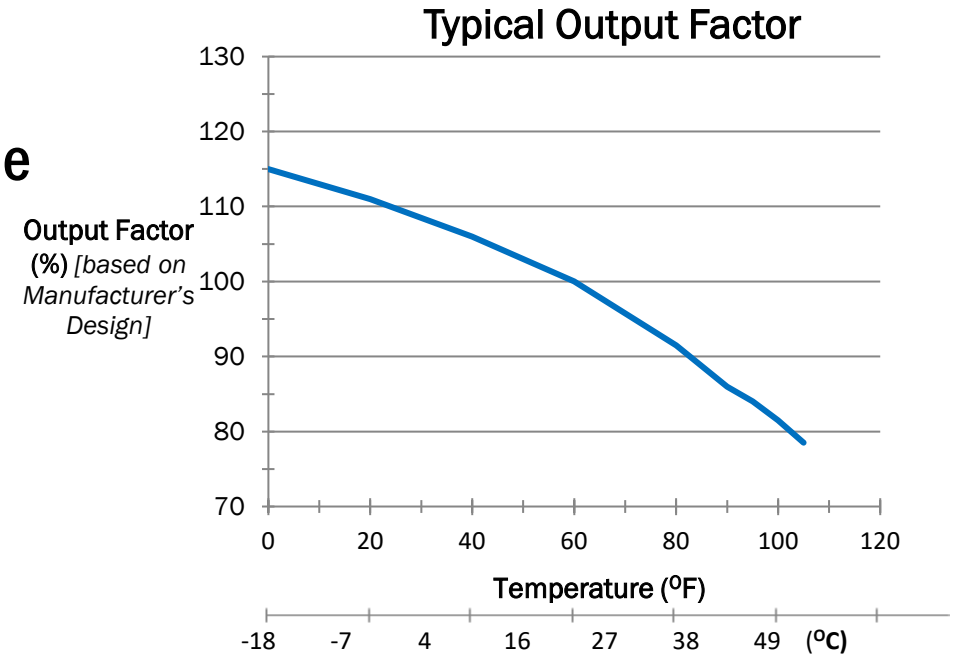
**Refer to ICAP Manual Section 4.2.2*

Average Ambient Temperature and Corrected MW Value

Combustion Turbine Example

- Temperature Corrected MW Value

$$\text{Corrected Test MW} = \frac{\text{Uncorrected Test MW}}{\text{Output Factor @ Test Temp}} * \text{Output Factor @ Historical Average Ambient Temp}$$



Average Ambient Temperature and Corrected MW Value

Combustion Turbine Example

Uncorrected Test MW: 100 MW

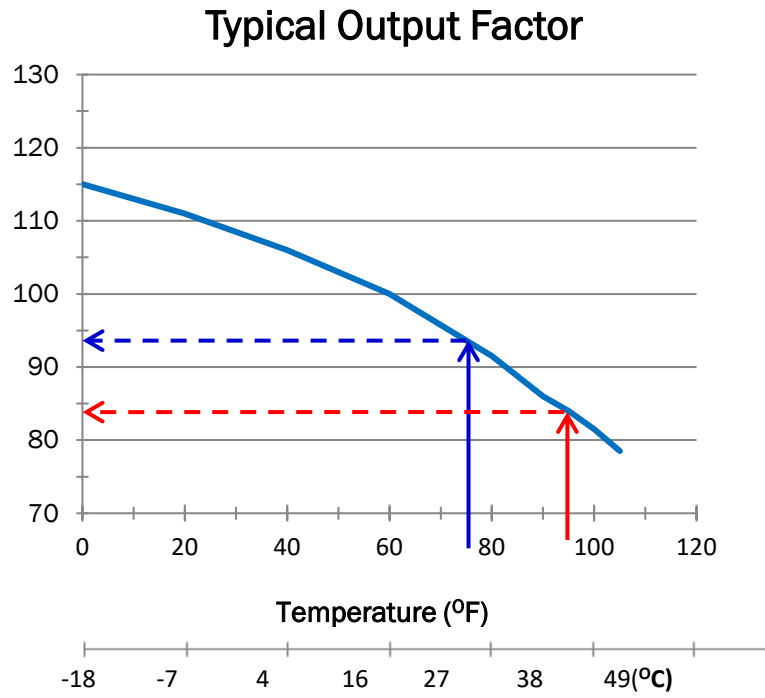
Test Temperature: 75° F

Output factor at Test Temperature = 94.5%

Desired (Historical Average Ambient) Temperature: 95° F

Output factor at Average Ambient Temperature = 84.5%

Output Factor (%) *[based on Manufacturer's Design]*



Corrected Test MW =

Uncorrected Test MW / Output Factor @ Test Temp * Output Factor @ Historical Average Ambient Temp

$$\frac{100\text{MW}}{0.945} * 0.845 = 89.4\ \text{MW}$$

Resource Specific Test Conditions

- **Criteria for Energy Limited (ELR) and Capacity Limited Resources (CLR)**
  - Sustained Maximum net output averaged over 4 consecutive hours
    - Integrated hourly average at top of each hour
    - Exceptions are Combustion Resources which will use a sustained net output for 1 hour

**ICAP Manual Section 4.2.2*

Resource Specific Test Conditions

- **Criteria for Energy Storage Resources (ESR) that do not utilize electrochemical technology**
  - Sustained Maximum net output averaged over 4 consecutive hours
    - May derate output to meet duration requirements
    - Currently, temperature correction for DMNC tests will not be necessary
      - Resources that are temperature sensitive will need to reflect that in their Real Time UOL, which will derate their capability
  - An ESR will not be eligible for Ambient Condition Dependent status
  - ESR's Generation Type in the ICAP AMS will be "Storage"

****For ESRs that utilize electrochemical technology, the sustained maximum net output is over one (1) hour - ICAP Manual Section 4.2.2*

Resource Specific Test Conditions

- **Criteria for other Intermittent Power Resources (IPRs)**
  - Includes Wind Farms, Landfill Gas and Solar
  - DMNC is entered as combined nameplate capacity of all units in each station net of station service Load

- **Criteria for Co-located Storage Resources**
  - ESRs participating as CSRs will follow model specific rules
  - Wind or Solar Intermittent Power Resources participating as CSRs will follow model specific rules

- **Criteria for Limited Control Run-of-River Hydro Resources (LCRoR)**
  - DMNC is entered as combined nameplate capacity of all units in each PTID net of station service Load

**Refer to ICAP Manual section 4.2.2*

Resource Specific Test Conditions

Criteria for Special Case Resources (SCR)

- One hour Performance Test once each Capability Period
  - Date and time specified by NYISO:
    - *For Summer Capability Test Period Aug 15 - Sept 9*
    - *For Winter Capability Test Period Feb 15 - Mar 7*
- Performance should demonstrate maximum enrolled MW value in the whole Capability Period
- NYISO will accept the higher of SCR's greatest load reduction in a first performance test hour or in a mandatory event hour
- SCR enrolled with an Incremental Average Coincident Load (ACL) or a SCR Change of Status may also be required to perform in the second performance test within the Capability Period

**ICAP Manual Section 4.12*

Resource Specific Test Conditions

- **Criteria for Behind-the-Meter Net Generation (BTM:NG) Resources**
  - Dependable Maximum Gross Capability (DMGC) test or actual production data
    - DMNC allowed if station service is netted out
  - Required duration of test is contingent on the BTM:NG resource type
  - Adjusted DMGC calculated and used in Net ICAP calculation

**Refer to ICAP Manual Sections 4.2 and 4.15*

Resource Specific Test Conditions

- **Criteria for External Resources**
  - External Generators
    - DMNC test data or equivalent will be verified with the External Control Area
    - All External Generators are subject to the same DMNC requirements as internal generators
  - Control Area System Resources
    - Control Area Resource and Load (CARL) Data

**Refer to ICAP Manual Sections 4.2, 4.4.3, 4.10 and 4.14*

Resource Specific Test Conditions

- **Criteria for Resources with an Energy Duration Limitation (EDL)**
  - Demonstrated Maximum Net Capacity (DMNC) or equivalent testing:
  - Initial DMNC: A new Resource with an Energy Duration Limitation must sustain maximum net output, during the applicable Peak Load Window :
    - **For the number of hours that correspond to its elected Energy Duration Limitation**, or
    - **For "out-of-period" tests, DMNC or equivalent data must be from the applicable Peak Load Window for the Capability Period for which the test is effective**
  - For each Capability Period following its initial registration, Resources with an EDL should perform a DMNC test during the applicable Peak Load Window, for a minimum of either:

    (i) Its elected Energy Duration Limitation or

    (ii) The duration required by its technology type outlined in *ICAP Manual* Section 4.2.2.1

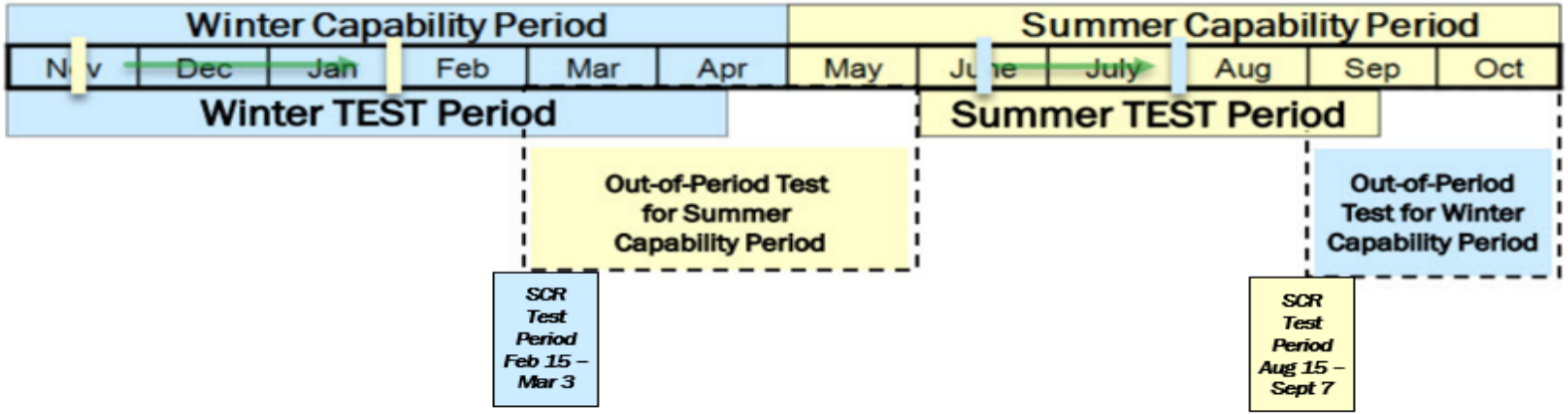
ICAP Manual, Section 4.2.1, 4.2.2.1, 4.2.2.2

Resource Specific Test Conditions

- **Criteria for Distributed Energy Resources**
  - Aggregations must perform a DMNC test once every Capability Period for the Aggregation as a whole, consistent with existing rules
    - Full duration test at maximum output
    - Include resource-specific breakdown of Aggregation's DMNC
    - Aggregation can only change its Energy Duration Limit (EDL) election for the Capability Year
    - Operating data can be submitted in lieu of a DMNC test
    - DMNC tests must be conducted within the applicable Summer and Winter "in-period" and/or "out-of-period" test windows
      - In alignment with the applicable Agg monthly DMNC calendar event
    - Aggregator must submit DMNC data for all DER that constitute the Aggregation, even if one or more DER do not provide capacity in the Installed Capacity Market

Topic 5:
Submitting Capability Period Test Data

Data Submittal - Timeline



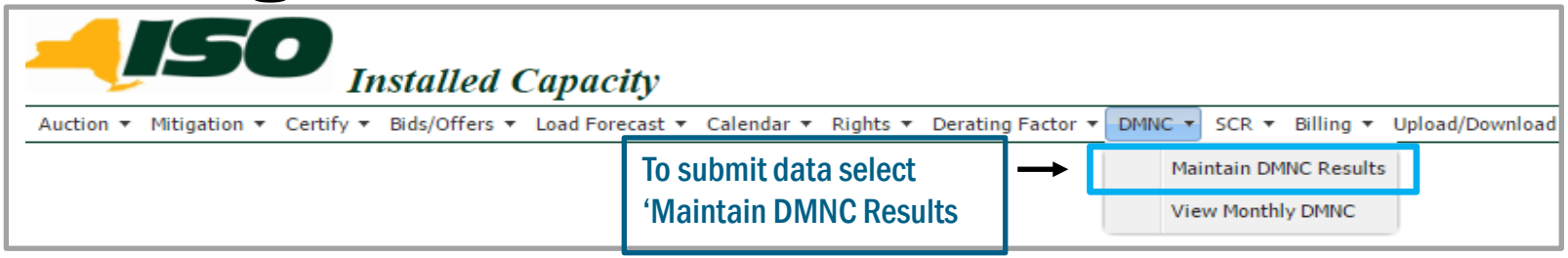
- Summer test submittal deadline: November 15th → February 1st
- Winter test submittal deadline: June 15th → August 1st
- Exceptions to this for Special Case Resources (SCR)
  - *Deadline is on or before 5:00 PM 75 Days after a test or an event*
  - *ICAP Manual Section 4.12.4.8*

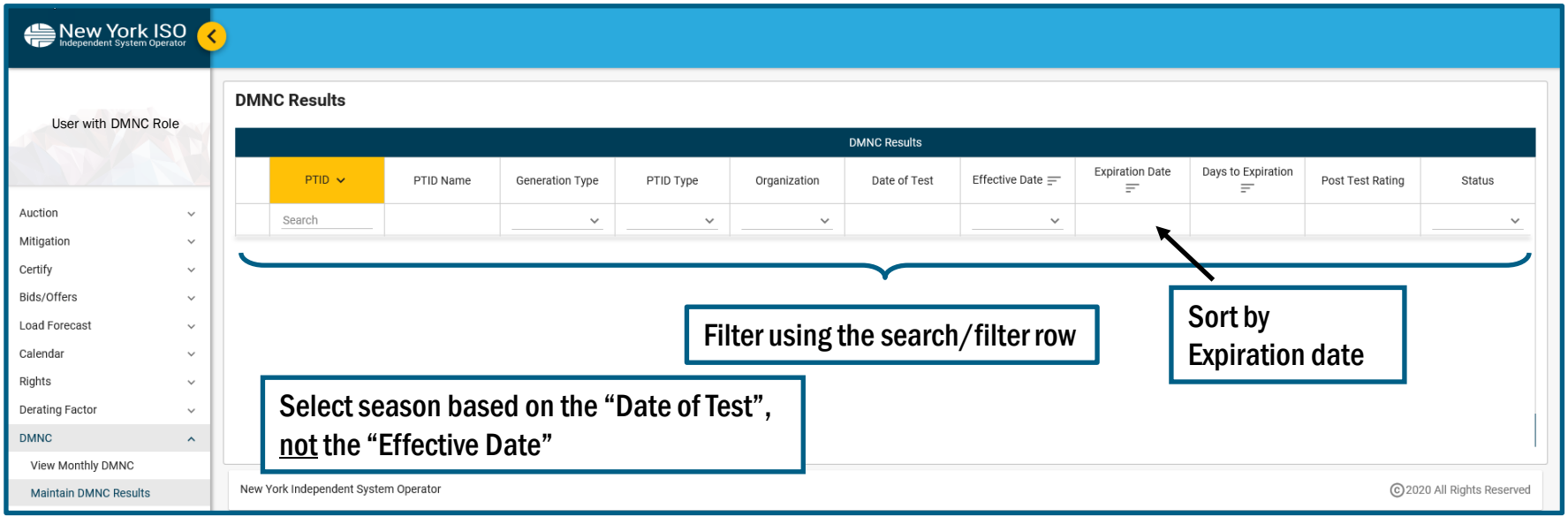
Data Submittal - Method

- **Submit data electronically via the ICAP Automated Market System (AMS)**
  - Can enter, maintain or view data online
  - Refer to
    - ICAP Manual for requirements
    - ICAP AMS User Guide Section 11 for entry directions

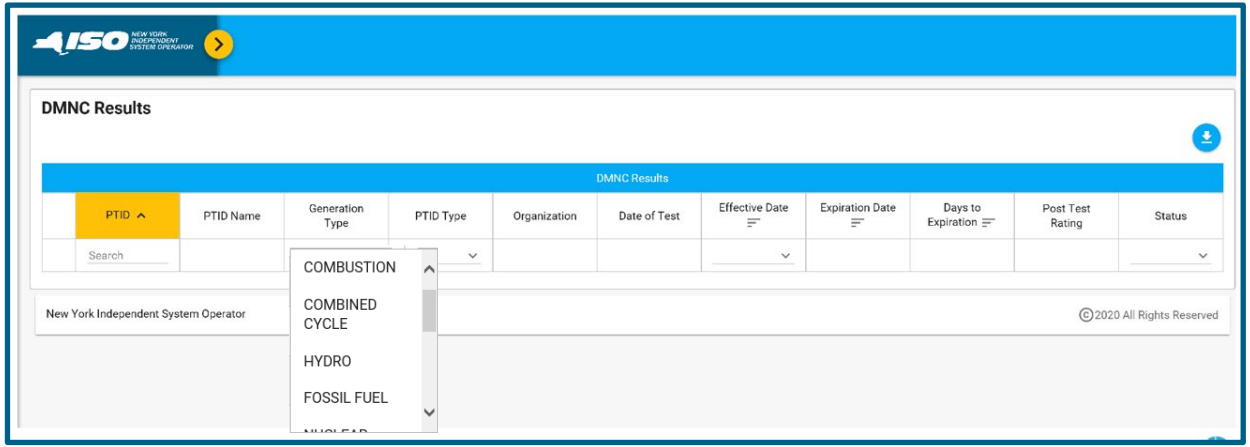
- **Exceptions to this for Special Case Resources (SCR)**
  - SCR submits performance data in Demand Response Information System (DRIS)
    - ICAP Manual Section 4.12.4.8

Submitting Test Data





Submitting Test Data in the ICAP AMS



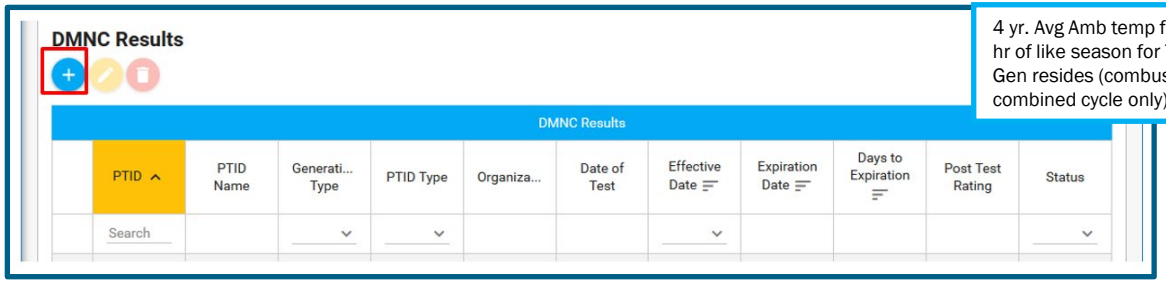
Generation Types:
All
Combined Cycle
Combustion
Energy Limited
Fossil Fuel
Hydro
Intermittent
Nuclear Steam
Storage
Other

PTID Type:
All
Internal
External
SCR

Use the filters above to access a list of relevant units

Submitting Test Data in the ICAP AMS

DMNC Results – User with DMNC privilege can Add DMNC Result

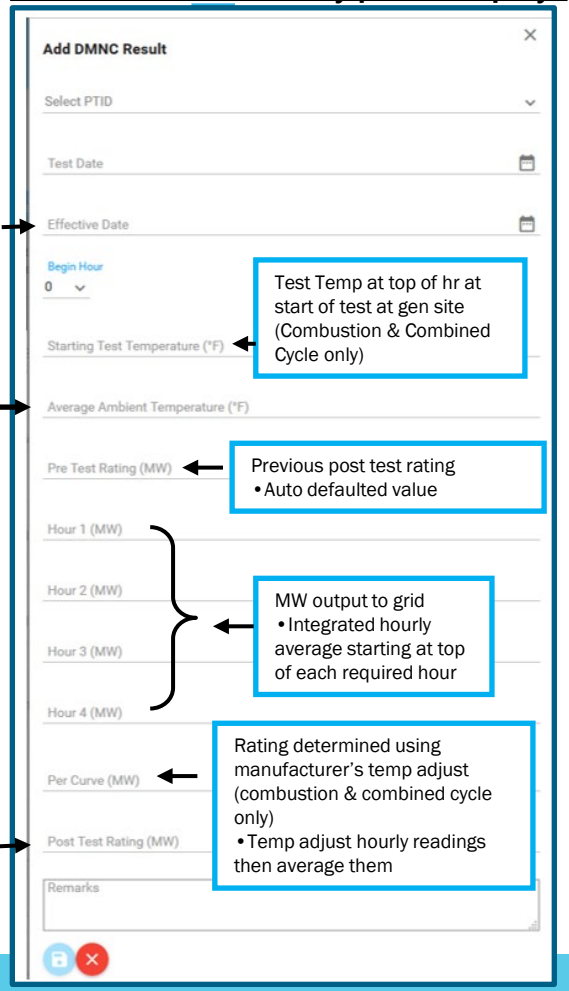


Effective Date – select first day of month the test is to be effective using calendar icon.
- Cannot be same day as test date
- Cannot be for month spot market has already run
- Must be >the system date
- Must be approved prior to certification close

4 yr. Avg Amb temp for peak day & hr of like season for TO where Gen resides (combustion & combined cycle only)

Actual DMNC/DMGC rating
- If> pre-test----red
- If out of period----blue

Add DMNC Result entry panel displays



Test Temp at top of hr at start of test at gen site (Combustion & Combined Cycle only)

Previous post test rating
- Auto defaulted value

MW output to grid
- Integrated hourly average starting at top of each required hour

Rating determined using manufacturer's temp adjust (combustion & combined cycle only)
- Temp adjust hourly readings then average them

NYISO Review & Approval Steps

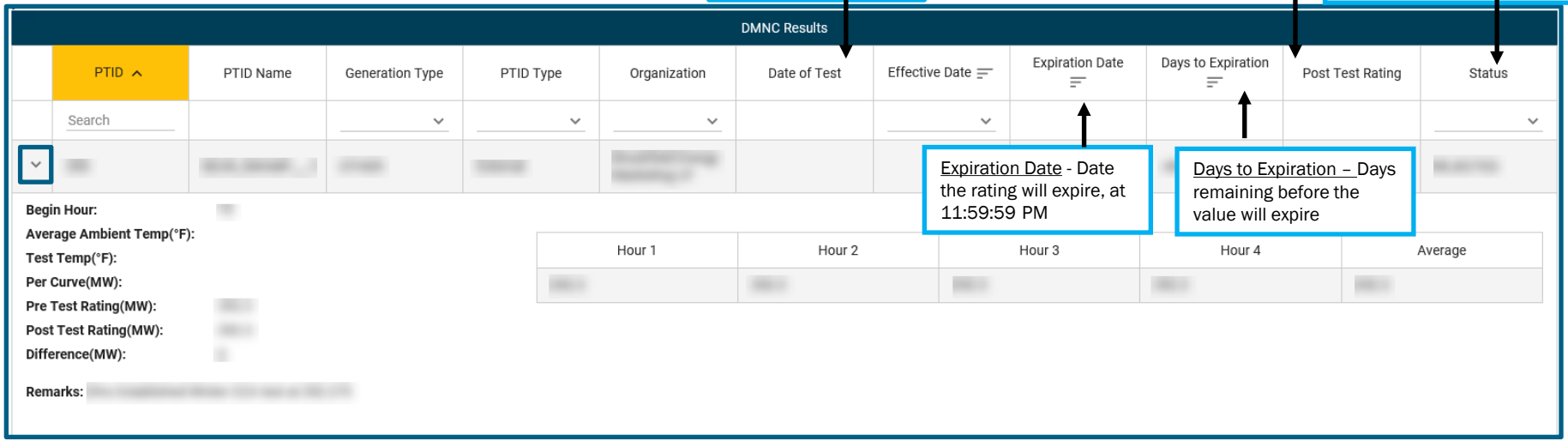
- **Submitted Resource Capability data is reviewed for completeness**
  - Determined within 10 days of receipt
- **Data is validated by NYISO**
  - Up to 40 days after submission (10-day determination + 30 Day review)
- **Resource Capability data rating validated and approved by the NYISO will be marked as either "approved" or "rejected"**
- **Approved data valid for:**
  - Balance of current period
  - Subsequent like Capability Period
  - Out-of-Period, as applicable
- **Non-NYCA Generators**
  - ICAP Supplier has same submission obligations
  - Data submitted will be verified with External Control Area operator

View Test Results in the ICAP AMS

Blue icon on *Date of Test* indicates an "Out of Period Test"

Red icon on *Post Test Rating* if the Pre-Test Rating < Post Test Rating

Status
- Approved by NYISO
- Rejected by NYISO
- Undecided—yet to be acted on



Expiration Date - Date the rating will expire, at 11:59:59 PM

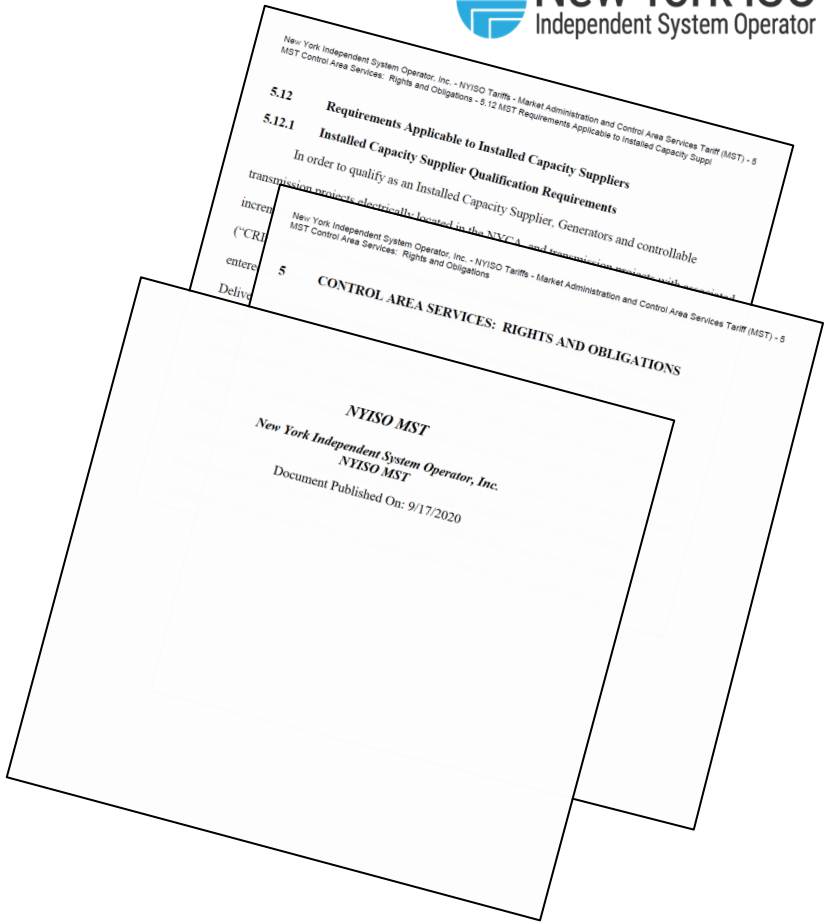
Days to Expiration – Days remaining before the value will expire

- The "Days to Expiration" field is color coded
  - Green: > 30 days
  - Yellow: Between 30 and 1
  - Red: Test Rating expired
- ICAP System sets the Expiration Date when the test rating is Approved

Topic 6:
Failure to Comply with Testing & Submission Requirements

Failure to Comply

- Not submitting data before submittal deadline
- Validated in-period test data does not meet or exceed out-of-period test rating used at the start of the Capability Period



Non-Compliance

- **Requirements must be met to be and remain qualified as an ICAP Supplier**
- **Examples of non-compliance associated with Resource capability testing**
  - Not submitting data before submittal deadline
  - Validated in-period test data does not meet or exceed out-of-period test rating used at the start of the Capability Period
- **Deficiency charge may apply – Market Administration and Control Area Services Tariff (MST) Sections 5.12.8 and 5.14.2**
  - Penalties and sanctions will be covered in more detail in the ICAP Market Sanctions & Deficiency Module

Summary

- Concept and Purpose behind Resource Capability
- Resource Capability Testing Requirements
- Scheduling Resource Capability Testing
- Resource Specific Test Conditions
- Submitting Capability Period Test Data
- Failure to Comply with Testing & Submission Requirements

References

- Market Services Tariff (MST)
- NYISO Installed Capacity Manual
- ICAP AMS User's Guide
- Market Participant User's Guide (MPUG)
- Transmission and Dispatching Operations Manual
- Accounting and Billing Manual
- TB 155 - Special Settlement Rules for Generators Conducting Certain Scheduled Steady State Tests