

NYISO 2015/2016 ICAP Demand Curve Reset

Dual Fuel Capability and Emissions Control Technology

ICAPWG
June 15, 2016

- **Provide additional information on the rationale for, and against, particular environmental control and fuel technologies, including:**
 - Selective Catalytic Reduction (SCR) pollution control technology and
 - Dual fuel (DF) capability
- **Today's discussion focuses on F class Frame peaking unit technology in Load Zones C, F, and G**

- **In 2013 DCR, FERC approved:**
 - Siemens SGT6-5000F5 (“Frame”) machine with
 - Load Zones G, J and K: dual fuel capability and SCR
 - Load Zone F: Gas only without SCR (with 950 hour run time limitation to meet NO_x minor source review and a limitation on net Energy and Ancillary Services [EAS] revenues to account for potential gas availability issues)

- **Review of Environmental Control Criteria and Evaluation of SCR**

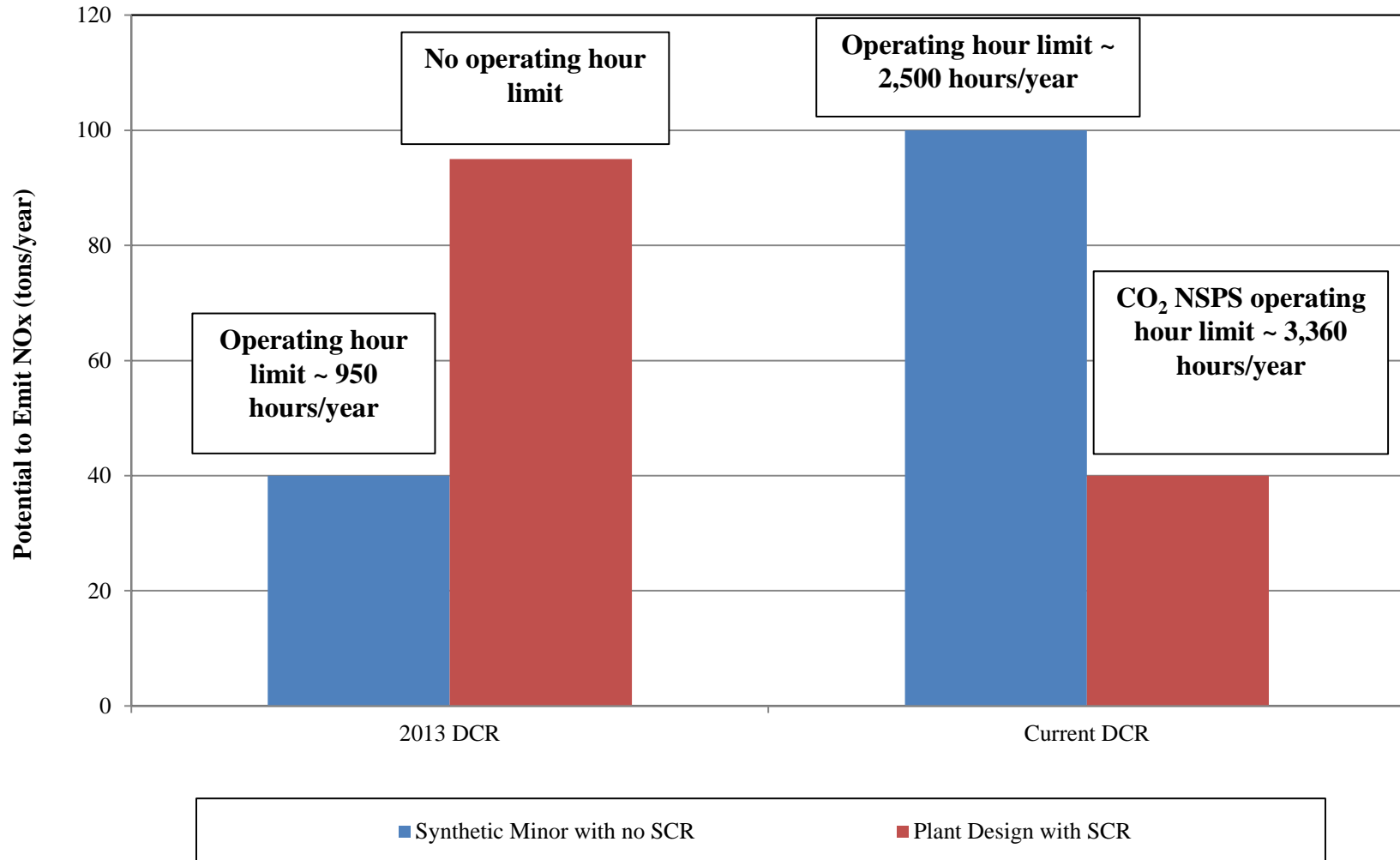
- **Review of Fuel Flexibility and Assurance and Evaluation of Dual Fuel**

Recommendation: Peaking unit should include SCR in all Load Zones

Rationale:

- **SCR technology mitigates certain siting and future market risks**
- **Permitting risks:**
 - Article 10 requires that “the adverse environmental effects of the construction and operation of the facility will be minimized or avoided to the maximum extent practicable...” (Public Service Law, Section 168(3)(c))
 - In the last reset (2013 DCR), taking the federally enforceable restriction on operating hours of the F class frame unit (~1000 hours) resulted in lower total NOx potential to emit (PTE) than an F class frame unit with SCR and no operating hour restrictions
 - In the current DCR, an F class frame unit with SCR will result in lower total NOx PTE than an F class frame unit without an SCR and an operating hour limit restriction (~2,500 hours) to avoid Non-attainment New Source Review (NNSR) in Load Zones C, F, and G-Dutchess

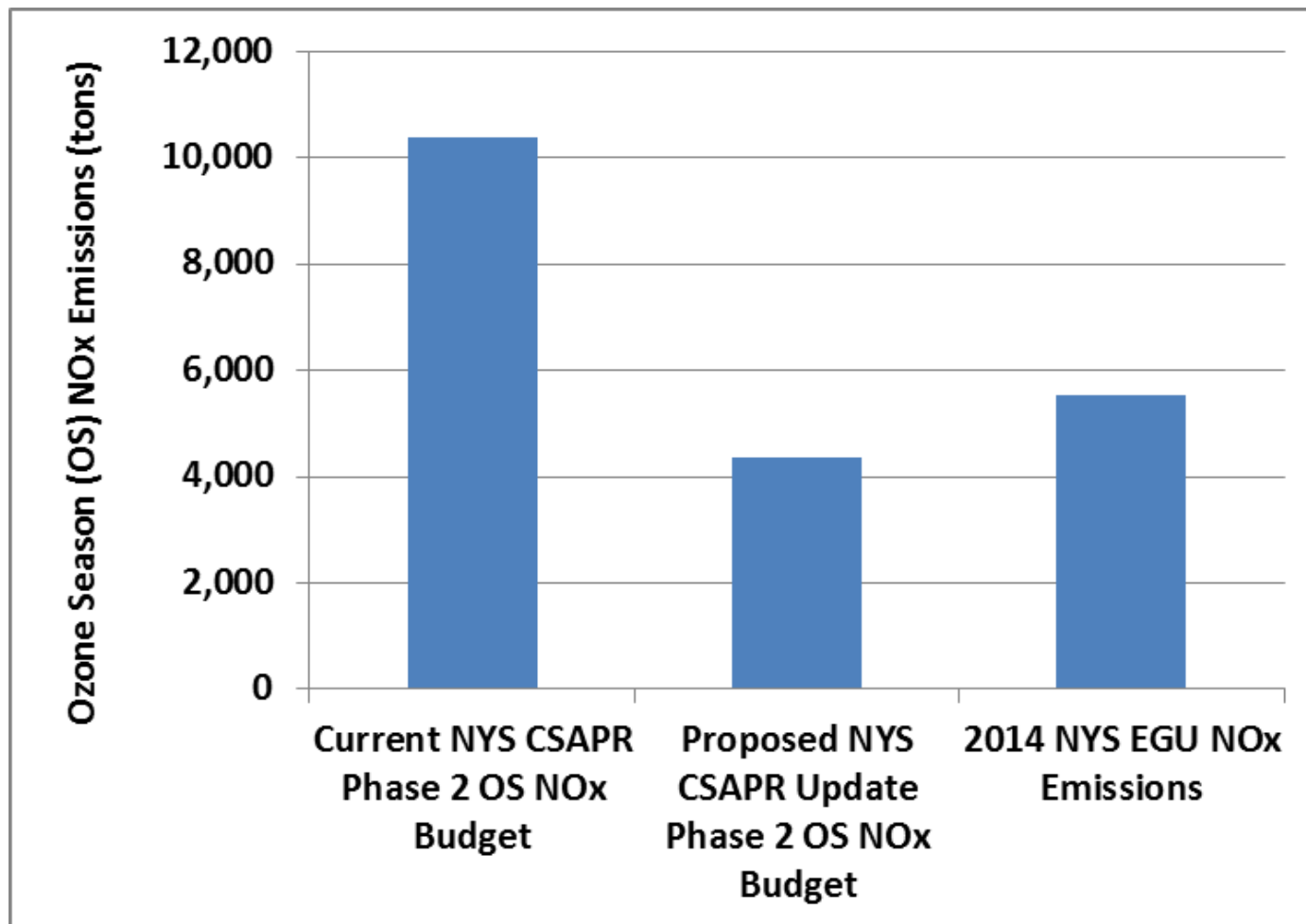
Potential to Emit (PTE) NO_x Emissions, Alternative Means of Compliance



Rationale (continued):

- **Development and market risks:**
 - Increased capital costs for future retro-fits of SCR
 - Local and environmental opposition
 - Promulgation of a more stringent Ozone National Ambient Air Quality Standards (NAAQS) since the 2013 DCR
 - Final area designations under the 2015 Revision of NAAQS for Ozone are planned for October 2017, with NYS possibly required to update Reasonably Available Control Technology (RACT) rules
 - Pending environmental regulations may place upward pressure on future NO_x allowance prices
 - Proposed updates under Cross State Air Pollution Rule (CASPR) reduce NYS ozone season NO_x budget by ~60%
- **Other considerations:**
 - Environmental run time limitation (i.e., ~2,500 hrs/year) for Minor Source designation is not anticipated to meaningfully affect net EAS revenues
 - It may not be possible to permit multiple peaking units using a Minor Source designation

New York State CSAPR Ozone Season NO_x Budgets and Electric Generating Units (EGUs) NO_x Emissions



- **Review of Environmental Control Criteria and Evaluation of SCR**
- **Review of Fuel Flexibility and Assurance and Evaluation of Dual Fuel**

- **Economics**
 - Increased capital costs, and fuel carrying costs
 - Increased net EAS revenues
 - Potential impact to ICAP revenues
- **Siting and Project Development**
 - LDC tariffs with dual fuel requirements (improves siting flexibility)
- **Other Risks**
 - Increase in future gas demand
 - Planned demand based on current price arbitrage (CPV Valley Energy Center, LDC)
 - Potential retirements of baseload nuclear and coal

Analysis Group has not yet reached a preliminary recommendation regarding inclusion of dual fuel capability for the peaking plant in Load Zones C, F and G. Analysis Group recommends maintaining dual fuel capability for Load Zones J and K.

Investment in dual fuel capability balances several economic tradeoffs

- **Increased costs, and fuel carrying costs**
 - Capital costs of installing dual fuel burners
 - Annual costs of carrying fuel and maintaining systems

- **Increased net EAS revenues**
 - Option to supply when the fuel oil price is less than the natural gas price (e.g., the price inversion that occurred during winter 2013/14)
 - Option to supply when gas would otherwise be curtailed
 - A meaningful risk without firm delivery, particularly to provide intraday supply (discussed in following slides)

- **The FERC approved dual fuel capability for the 2013 DCR in Load Zones G, J, and K based on several factors, including:**
 - A peaking plant would realistically choose dual fuel capability over primary firm transportation
 - If a peaking plant did not have dual fuel capability, it could not be sited in the network of a local distribution company;
 - A unit would need to site close enough to an interstate pipeline and pay fees to obtain firm capacity
 - Costs of interstate pipeline connection and obtaining firm capacity would exceed the costs of dual fuel capability

Investment in dual fuel capability balances several economic tradeoffs

- **Changes to Equivalent Demand Forced Outage Rate (EFORd) may affect capacity revenues (in UCAP)**
 - Fuel diversity may limit out-of-merit designations for fuel related restrictions and reduce EFORd, which increases UCAP related revenues
 - Operating challenges and outages during fuel switches may increase EFORd, which decreases UCAP related revenues

- **Increased option value in EAS markets and hedges against future regulatory and market changes**
 - These attributes are not fully quantified in the DCR analysis, which reflects a “deterministic” forecast

- **Market Factors – future natural gas demand**
 - Natural gas is the predominant fuel for electricity generation in New York State and has steadily gained market share over time
 - Future demand for natural gas will likely increase based on known and projected market changes:
 - Increased generator demand from anticipated new entry (e.g., CPV Valley Energy Center)
 - Increased future generator demand due to replacement of existing nuclear and coal fired generation
 - Reduced supply of pipeline deliverability if new projects are cancelled or not approved (e.g., Northeast Energy Direct and/or Constitution)

■ Regulatory Factors

- Stronger scarcity/shortage pricing would create improved pricing signals and should increase incentive to maintain adequate fuel supply
 - May be captured through annual updates going forward, but would not be reflected in the current “build” decision
- Reliability requirements or incentives
 - Regulatory standards on fuel certainty
 - Other regions have implemented fuel assurance market designs that increase the potential for energy market revenues (e.g., ISO-NE Pay for Performance and PJM Capacity Performance programs)

■ Siting Issues

- Dual fuel units have greater geographic siting flexibility, including connection to LDC systems
 - LDCs maintain “strict dual-fuel requirements” (NERC, 2016) including requirements for interruptible service
 - Potential to avoid contract costs for firm gas supply on interstate pipelines
 - Potential “co-location” flexibility given dual gas- and electric- interconnection requirements

- **While dual fuel provides an option in EAS markets and mitigates certain siting, regulatory and market risks, the value of these options and risk mitigation will depend on future uncertain events – for example, the following factors would tend to diminish these values:**
 - Development of new and/or planned pipeline expansions
 - Continued abundant shale supplies
- **Historical operating data suggests there have been limited periods of constrained fuel shortages**
 - NERC (2016): “... based upon the operational risk metrics, the New York region is not projected to experience tight operational margins for upcoming seasons.”
- **Other policies and developments promote fuel diversity and flexibility to address constrained or localized need**
 - Transmission expansion projects anticipated to be in-service 2018/19 may increase deliverability (e.g., AC T transmission and other public policy projects)
 - State regulatory changes in support of carbon policy (e.g., NY RPS, NY SUN, potential Clean Energy Standard) may provide support to non-gas units (nuclear, renewables) and/or reduce overall energy consumption

- **2013 DCR reviewed gas-only and DF economics considering a limit on fuel availability**
 - Eliminated net EAS revenues on days with a maximum temperature of 20° or lower* (see next slide)
 - May provide an upper bound to gas curtailment risk impact on net EAS revenues
- **Quantitative analysis of dual fuel economics is being developed**
 - Objective is to have analysis reflect net EAS model, including elements still under development (e.g., final level of excess adjustment factors [LOE-Afs])
 - Other elements of the net EAS model still under review may affect dual fuel economics (and to the extent that they are not fully captured in the final model, they would be considered qualitatively)
 - Intraday gas price effects
 - Opportunity cost to provide reserves
 - Potential EFORd impacts from limits to fuel availability (see above)
- **Quantitative analysis will not fully capture all optionality and risk mitigation value provided by dual fuel technology**

** Note: The EIPC (Final Draft Target #3, 2015) also considered a temperature restriction, “reflect[ing] the non-firm character of service typical of local transportation service to almost all gas-fired generators located behind the citygate ... in order to provide a greater probability of local service ... in the baseline pre-contingency mode.” (p. vi)*

Number of days with maximum temperature less than 20° by Capability Year and Load Zone

Zone	Weather Station	2013-14	2014-15	2015-16	Average
C	Binghamton Greater Airport	28	22	8	19
F	Albany Airport	15	16	4	12
G	Poughkeepsie Dutchess Airport	3	5	1	3
J	JFK International Airport	4	0	1	2
K	Islip Long Island Macarthur Airport	4	3	1	3

Source: National Oceanic and Atmospheric Administration Temperature Data

■ SCR Technology for other units:

- New Source Performance Standards (NSPS) for combustion turbines will require SCR for GE LMS100PA+ and GE 7HA.02 in order to meet NO_x emission limitations. This applies to all Load Zones.
- Standard design for reciprocating internal combustion engines (RICE) include SCR. This applies to all Load Zones.
- Siemens 5000F(5) combustion turbine will meet NSPS NO_x limits without an SCR, however other factors will impact the need to include SCR at gas-only facilities, which are covered in the previous slides.
 - Load Zones C, F, and G (Dutchess) have a non-attainment new source review (NNSR) major source threshold for NO_x of 100 tons/yr. This requires a 5000F(5) simple cycle plant to accept a federally enforceable operating hour restriction of approximately 2,500 hours/year to avoid Lowest Achievable Emission Rate (LAER) NO_x control technology (i.e., SCR)
 - New Source Performance Standards (NSPS) for CO₂ emissions from “non-base load” combustion turbines would require an operating hour restriction of approximately 3,360 hours/year. A 5000F(5) simple cycle plant with SCR, limited to 3,360 hours/year of operation would emit approximately 40 tons/year of NO_x.