The Uniform Generation Performance Standard:
Connecting Electric Industry Restructuring
and Air Quality Improvement

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Competition is a Contact Sport

Business is a contact sport where contestants battle each other for their piece of the competitive market. This is the case, at least, for most businesses and it is beginning to be the case for the electric industry sector. Historically, the electric industry has been more of a playground than a playing field: monopolistic entities have had to manage the process of government regulation, but they have not had to compete for market share or face the other harsh realities of a competitive market. All that is changing. Many states like California, Pennsylvania, Rhode Island and Massachusetts have begun to rewrite the regulatory gamebook that protects the electric industry from competitive forces. Public policies based on “simulated competition,” such as rate of return regulation and integrated resource planning, are being replaced with radical reforms that aim to create robust and thriving competition with many buyers and sellers, all subject to the same rules and conditions. This restructuring of the electricity industry is happening quickly, dramatically, but as of yet, incompletely.

How to Deliver Competition:
The Uniform Generation Performance Standard

The Uniform Generation Performance Standard (UGPS) is a market-based approach to reducing emissions which levels the playing field for competing sources of generation. It represents the amount of a pollutant such as Oxides of Nitrogen (NOx) that a power plant may discharge for a kilowatt-hour of electric output. The UGPS is an output-based emission rate (lb/kwh), as opposed to the traditional input-based standards (e.g., lb/mmBtu).

The UGPS can be part of a cap-and-trade program where the amount of allowed emissions (the “cap”) in a particular area (i.e., state or region) is tied to a health-based standard for overall emissions in that region. The UGPS is then calculated by dividing the cap by the expected generation for that region over a set period of time to arrive at a lb/kwh standard.

Unlike current regulations, the UGPS applies the same standard to all plants. It also provides flexibility through a cap-and-trade mechanism for individual plants to buy and sell emission allowances in meeting their emissions obligation. Units whose emission rate is below the UGPS have excess NOx certificates to sell into the market or to bank for future use. Units whose emission rate is above the UGPS have a variety of options through which they can match NOx emissions to NOx certificates, including installation of pollution control equipment, fuel switching, reduction in megawatt hours generated, use of banked certificates, and purchase of certificates from other generation units. Thus, the UGPS coupled with the ability to trade allowances ensures that reductions are achieved cost-effectively (i.e., at the lowest achievable cost).
One of the key areas yet to be fully addressed is how to align old fashioned “command and control” environmental regulations with the emerging competitive market place in generation. The old rules and the old policy tools do not work effectively in this new world. Historically, monopolies were granted franchises so it was immaterial if environmental regulations varied amongst players since they never competed head to head against one another. In such a world, regulators were concerned about costs, not markets, so it made sense to design environmental regulations in relation to costs (i.e., inputs such as fuel). Today, these inherited rules are cumbersome, inefficient and apply unequally to different players. In varying degrees, they undermine both competition and environmental progress. If we are going to pull the proverbial rabbit – the competitive market – out of the monopolist’s hat, we need to invent some new tricks.

A Uniform Generation Performance Standard (UGPS) (see inset box on the first page) is a star player in the new competitive arena. Properly designed, a UGPS can unite the goals of environmental protection with robust competition while balancing political realities.

**The Inherited Rules of the Playground**

The emerging competitive market in the electric industry is currently subject to all the environmental regulations that were created under the historical monopolistic structure. The inherited rules have a built-in bias against new facilities because of the gap, which continues to widen, between air emission requirements for older facilities and those applied to newer plants. In a competitive market, this growing gap is of such a magnitude that it constitutes a barrier to entry for newer, cleaner, more efficient technologies.

For example, current environmental laws and regulations hold new power generating facilities to a “new source” performance standard, which itself is designed to bring about technological progress in emission controls for stationary sources. This standard tends to be ratcheted tighter over time, so that new plants face increasingly strict standards. Specifically, environmental policies require new plants to limit their NOx and other emissions to levels achieved using the “best available” or “lowest achievable” control technologies. In addition, new plants must also offset these emissions (at a higher than a 1:1 ratio in non-attainment areas) with reductions at other sources. In practice, this means that new plants often have to buy costly emission offsets from old plants, which were originally allocated the emission rights under the 1990 Clean Air Act.

These rules are basically designed to ensure that new plants will not significantly worsen ambient air quality. But the net result is that new facilities must become cleaner and cleaner, while older, existing facilities are continually allowed to emit substantially higher discharges. In a competitive world, this disparate treatment between old and new facilities gives older plants a cost advantage. Extraordinarily tight emissions standards for new plants impose high up-front capital costs as well as added operating and maintenance expenses as a sort of “ticket to entry” into the market. Thus, new facilities subsidize older facilities with direct payments by purchasing emission offsets as well by bearing the burden of meeting stricter environmental regulations.
Older power plants face significantly different requirements than new plants. Plants built before the adoption of post-1970 Clean Air Act requirements are allowed to discharge much higher amounts of pollution. Existing plants in regions that meet current ambient air quality standards are allowed to emit substantial amounts of NO\textsubscript{x} -- often 10 times as high as newer plants.\textsuperscript{1} Many utilities located in the Midwest states of the Ozone Transport Assessment Group ("OTAG") region have older, dirtier power plants and have average emissions rates for their fossil standard that are two to three times as high as those of utilities in the downwind non-attainment states.\textsuperscript{2} Because the older plants are grandfathered, they have avoided having to make expensive pollution control modifications and often enjoy lower operating costs, though their emissions often blow to downwind states, worsening the poor air quality in those ozone non-attainment regions. This oddly-tilted regulatory playing field creates artificial value for older, dirtier power plants, which operate in ways counter to our national competition and conservation objectives.

The problem is not limited to older plants in ozone attainment areas. Older plants within ozone non-attainment areas have had to put on additional NO\textsubscript{x} pollution control equipment (or take steps to otherwise reduce emissions) in recent years in order to help enable their states to attain ozone standards. Even with these tighter NO\textsubscript{x} controls in place, however, these older plants still emit substantially higher discharge levels than newer plants located there.\textsuperscript{3} Newer, cleaner, and more efficient technologies, such as combined cycle units which burn natural gas, incur substantial environmental costs without any corresponding recognition of their environmental benefits relative to higher emitting facilities. In Massachusetts for example, which is an ozone non-attainment area, new independent power production facilities generated 21% of the state's fossil-fired electricity in 1995, but are allowed to emit only 8% of the NO\textsubscript{x} emissions budget. In New Jersey, another non-attainment zone, the numbers are even more compelling: independent power producers generated 54% of the state's fossil-fired electricity in 1995, but only emitted 14.5% of NO\textsubscript{x} emissions.

Exhibit 1 illustrates these differences among four actual power plants, all located in the Northeast: an older coal-fired plant located in an upwind attainment area; an older coal-fired plant located in a downwind non-attainment area; a newer oil-fired plant in a non-attainment area; and a new natural gas-fired combined cycle plant in a non-attainment area. The differences are dramatic. The old coal plant emits NO\textsubscript{x} at a rate that is over four times the rate of the new gas fired plant, on a lb/mwh basis. Exhibit 2 shows that such disparities also lead to substantial differences between companies. Midwest utilities may average up to ten times more NO\textsubscript{x} emissions per MWH of those in the Northeast.

Such inequitable treatment in environmental requirements stymies competition by creating a significant barrier to entry for new power generators. In order to compete successfully, a prospective generator must produce and sell power in a way that provides

\textsuperscript{1} As shown in Exhibit 1, a 1950's-vintage coal plant in an attainment area in Pennsylvania emits NO\textsubscript{x} at a rate of around 12 lbs./mwh, as compared to a 1990's-vintage natural gas-fired plant in a non-attainment area in Massachusetts, which emits NO\textsubscript{x} at a rate of 1.1 lb/mwh.

\textsuperscript{2} See Exhibit 2.

\textsuperscript{3} See Exhibit 1, which shows that an older (1960's-vintage) coal plant in Massachusetts emits NO\textsubscript{x} at a rate of around 6.0 lbs/mwh, as compared to a newer, 1970's-vintage oil fired plant (2.8 lbs mwh) and a newer, 1980's-vintage natural gas plant (1.1 lbs/mwh).
itself with sufficient revenues to cover its construction, operating and other costs, as well
as provide a return on investment. Existing environmental policies prevent (or at least
delay) the introduction of new plants by changing the bottom line, by making new plants
less profitable despite the environmental benefits that they offer. For example, two
prospective new coal-fired facilities were canceled in Massachusetts in 1996 due in large
part to environmental requirements specifying that they emit at a fraction of the rate of
existing facilities.

The net effect of the existing rules is double trouble: they simultaneously distort
the market place and deter environmental progress.

From Playground to Playing Field: Establishing Efficient, Market-Based Means of
Environmental Protection

If competitive generation markets are to reflect the full cost of electricity
production, all costs including externalities such as environmental damage need to be taken
into account. If producers do not bear the cost of environmental damage, then prices are
inefficient. When prices closely reflect the level of environmental damage, efficient
incentives exist for reductions in emissions. As a normal part of cost minimization and
profit maximization, generators will undertake more inexpensive controls and forego
relatively expensive, unnecessary controls in order to meet a required level of emissions
“performance.” As a result, required reductions are achieved efficiently at minimum cost.
This idea underlies existing cap-and-trade programs, such as the one established for SO₂
under the 1990 Clean Air Act.

Efficiency concerns alone, however, do not achieve all objectives of electric
industry restructuring. While a cap-and-trade program may lead to a more efficient
allocation of emissions reductions, it can have a wide variety of financial consequences for
the owners of generation facilities. Just because cap-and-trade programs internalize greater
cost per unit of output for higher emitting plants, they do not necessarily lead to greater
costs for the owners of those plants. Overall costs will depend on the manner in which
emission “rights” are allocated. Allocations may also have inefficient consequences for the
mix of new generation facilities that are added over time. For example, while the current
SO₂ cap-and-trade program is more efficient than historical “command and control”
environmental regulations, it still perpetuates inefficiencies because the initial allocation
scheme rewarded the historically big polluters at the expense of the newer cleaner market
entrants. That is why a UGPS that is applied equally to all generators is the right solution
for both environmental protection and competitive markets.

The Uniform Generation Performance Standard (UGPS)

In a competitive marketplace, price and outputs, not cost and inputs, are
fundamental. To maintain an input-based measurement system (e.g., lb/mmBtu) in an
output-based market economy is to transpose the rules of the playground onto the playing
field. It creates the wrong incentives. The Uniform Generation Performance Standard
(UGPS) is a market-based approach to reducing emissions that levels the playing field for
competing sources of generation by providing a consistent allowed emission standard for
all sources. The UGPS differs from traditional air pollution standards in that it is an
output-based emission rate, expressed for example as a lb/kwh, rather than the traditional
input-based standard that reflects an allowed amount of emissions per unit of fuel burned. Output-based standards are preferable to traditional input-based standards, as they capture differences in efficiency among sources in converting input energy (e.g., heat) to useful output (e.g., electricity) and therefore reward efficient use of energy.

To ensure that generators together emit no more pollution than is allowed while also having the flexibility to meet their emissions obligations in a cost-effective manner, the UGPS approach can include a cap-and-trade program. The cap, presumably, would be set to achieve some overall health-based emissions level for a region. The UGPS would be set by dividing the cap -- the total emissions in a particular area (i.e., state or region) in any time period, by the total expected generation for the region. Individual sources would be free to buy and sell allowances depending on their relative costs of control. Low-cost control sources could “overcontrol” (i.e., emit at a rate below the allowance rate) and bank their allowances, retire them, or sell their excess allowances to sources for which controls would be more expensive. This flexibility allows total reductions to occur at a total cost that is much lower than if all sources were required to meet an allowed emissions rate on their own.

Unlike other cap-and-trade programs which rely on historical emission levels, the UGPS itself establishes initial allocations of allowances among plants in a trading region. The UGPS in any time period would be calculated by dividing the cap by the total amount of electric generation produced in that geographic area. All generators in the area would be allocated an amount of allowances equivalent to the UGPS times their plant’s actual generation.

The basic premise behind the UGPS is simple: for equity reasons, all generators should be permitted to emit at an equal rate -- that is, the uniform emissions standard. For efficiency reasons, generators should have the flexibility to choose an emissions control strategy that is most cost-effective for their individual facilities. The UGPS is the ultimate fair and efficient policy instrument for both environmental protection and for electric market enhancement. In particular, the UGPS:

- serves as the means to allocate emissions allowances among market participants in the power sector in a fair way that doesn’t advantage incumbent power producers or grandfathered power plants;
- removes barriers to entry to new generators by giving them allowances in proportion to their generation -- enhancing competition and increasing use of cleaner more efficient technologies;\(^4\)
- rewards unit efficiency by allocating emissions allowances in the first instance based upon emissions per kilowatt-hour of output, rather than on heat input;

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\(^4\) Indeed, if environmental regulations were reformed in a way that focused primarily -- or even exclusively -- on a UGPS type of approach as opposed to a new source performance standard approach or a best available control technology approach, then new firms could make efficient decisions about the combination of control strategies and other mechanisms (purchases and allowances) necessary to meet an overall health-based cap with a UGPS.
• offers flexibility for each facility to undertake cost-effective reductions while avoiding comparatively expensive controls;

• utilizes market forces to achieve reductions at least possible cost; and

• avoids many problems of other cap-and-trade programs including the creation of “rents” which occurs in allocation schemes based on historical emissions or other allocation techniques.

No other single policy instrument accomplishes so much, so elegantly. While superior to all alternatives, however, no such wide-sweeping alteration in environmental policy will be adopted without challenges. There are a number of design issues that need to be addressed to fully implement a UGPS program.⁵

**Implementation Issues of UGPS**

As with any program designed to control emissions, the UGPS can be linked to establishing an overall emissions limit. In this case, a limit means setting the cap on overall emissions and determining the allowed emissions per kilowatt-hour given that overall cap -- things that are inherently difficult politically and technically. Regulators will need to address all of the design issues outlined above (e.g., determining the cap for a region, establishing market rules, deciding how to address uncertainty in expected levels of generation for any time period, etc.). Of course, most implementation challenges are not unique to UGPS.

In fact, the formula for allocating rights is much easier and more straightforward under the UGPS than it is under traditional allocation approaches. Units that emit below the UGPS have rights to bank or sell in proportion to the difference between their actual emission levels per kwh and the UGPS standard. Those units that emit at a higher level than the UGPS are not entitled to any such “rights,” and indeed, must obtain allowances from others or reduce emissions.

The allocation would result from a calculation (i.e., the emissions allowed under the cap, divided by total generation, equals the UGPS). Each plant would receive allowances equivalent to its generation output times the UGPS. In contrast, alternative cap-and-trade allocation schemes have proven notoriously difficult. Recently, setting an overall NO₂ cap in the Ozone Transport Region involved developing a difficult consensus over appropriate levels of reduction for facilities from a base year (1990). A number of utilities objected that emissions in 1990 were uncharacteristically low. Each state then had to take the additional step of establishing final allocations for each facility -- a process made more difficult by the fact that facilities completed after 1990 had been altogether neglected in the analysis and inadequate provisions had been made for future facilities. (See inset box on the next page for a discussion of how this process went wrong in Massachusetts.) Worse still, pressures will build over time to renegotiate allocations as the base year becomes less

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⁵ These include: size of the trading area; targeting of emissions seasons; treatment of variations in generation levels from expected to actual levels; allowances banking; localized concentration of emissions; establishing UGPS rates for cogenerators.
and less representative of current emissions. No such subsequent negotiations would be needed under UGPS as allocation "rights" are set annually by generation levels.

Greater challenges lie in establishing a program in widespread regions (e.g., east of the Mississippi). Such efforts will be helped, however, by building on previous regional efforts by the Ozone Transport Commission and OTAG as well as using federal authorities. By contrast, it would be much less effective to operate this program within a single state, or to have a patchwork quilt of different UGPS programs established by various states leading to wide discrepancies and inefficiencies in control costs, differing values for UGPS emission rights, continued issues related to ozone transport, and other problems.

Even so, several states have already indicated their interest in adopting a UGPS approach. For example, Vermont regulators have advocated adopting a UGPS-type approach as part of their restructuring policy changes, and the Massachusetts legislature is considering a UGPS in an electric industry restructuring bill submitted by the Governor.\(^6\)

There is every indication that these states are considering adopting this policy on a go-it-alone basis simply because they don't want to wait for coordinated federal action and they may see some first-mover advantage to induce other states to adopt parallel approaches.

### Conclusion: How to Turn the Bully of the Playground into a Free Marketeer

Environmental regulations can either undermine or reinforce competition. The existing rules subsidize older, dirtier facilities by exempting them from stricter standards that newer facilities have to meet (and pay for). Thus government regulations alone confer a substantial market advantage to some players over others. And the market advantage is of such a nature -- where older facilities have a lower cost structure than newer plants and emit substantially higher amounts of pollution per unit of electricity they produce -- that it retards the very goal -- environmental protection -- it was designed to achieve. In effect, the current regulatory regime creates barriers to

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\(^6\) Notably, those states have proposed applying the UGPS to all retail electricity sales in each state, rather than to all facilities located in their states.
entry for newer, cleaner technologies in the competitive marketplace and thereby slows the pace of environmental progress.

The real bully of the playground is public policies that reward old and dirty over new and clean. Business, being a contact sport, will use whatever equipment and other strategies that maximize its profits and give it an advantage in the competitive arena. Thus, we should not be surprised that the current owners of these facilities seek to perpetuate the existing system in the emerging competitive marketplace. But we should not be deterred. The way to unite environmental protection with economic efficiency, while balancing the political realities, is by adopting the UGPS to regulate air quality. Other options create serious market distortions and achieve less for the environment. With UGPS, the winners are manifold:

1. Competition will be enhanced through reduced barriers to entry, allowing more suppliers to compete in markets.

2. Consumers benefit from more robust competition through improved product innovation and better services, including cleaner electricity and efficient low prices.

3. The public’s health, often represented by environmentalists, will benefit because the goal of environmental protection is advanced to a greater degree than under the current system.

4. Regulatory policies, including allocation of emissions allowances, can be implemented and administered much more quickly and easily than under the current system.

The old rules offer no such benefits. They do clean up the air, but they also distort the market, cause harm, and achieve environmental improvement at higher cost than necessary. If the UGPS is chosen appropriately, it will not cause harm even to those who have historically been grandfathered from the newer, stricter standards. For example, the OTAG final recommendations for NOx emission controls include a range of reductions up to 85% below current levels. At the high end of the range — 85% — the estimated cost of compliance is $3.4 billion dollars annually, which is 2% of total annual revenues for utilities in the OTAG region. This estimate assumes the traditional “command and control” implementation method where all parties have to install technological fixes. If a cap-and-trade program using a UGPS were adopted, further efficiencies would be gained and the cost of compliance would be even less. These environmental improvements may not even raise electricity prices, as long as the plants that need to incur expenses are not on the margin, since market prices are set by the costs of marginal producers. Opinions may vary, but such a price for environmental improvement and market efficiency seems reasonable, bearable and just.

The creation of a competitive marketplace is not a trivial task. A lot of work has already been done in areas such as transmission access and market concentration, but environmental regulations still need to be realigned with the competitive world. The UGPS is the place to start. The UGPS is the right measure for the environment and goes a long way to evening out the odds for all players engaged in the contact sport of electric generation.
Exhibit 1. Emissions Rates for Four Existing Power Plants

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<tr>
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<th>NOx Emissions (lb/MMHr)</th>
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</tr>
<tr>
<td>Older Coal in Non-Attainment Area</td>
<td>6</td>
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<td>Newer Oil in Non-Attainment Area</td>
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<td>New Gas in Non-Attainment Area</td>
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Sources:


Notes:

Emission Rates are for 1990. Rates may change subject to requirements of the CAAA of 1990.
Exhibit 2. NOx Emission Rates for the 50 Largest Electric Utilities