Commission issued its Reforming the Energy Vision order,[113] determining that the DSP function be filled by incumbent utilities, as opposed to an independent entity. The main reason for this is to avoid creating redundancy in system planning and operations.[114] The order put forward transitional steps, requiring each utility to undertake an IRP-like, least-cost planning exercise, called a Distributed System Implementation Plan (DSIP), which:

> *[S]hould present the utility's proposed investment plan for the next five years, and should reflect an integrated view of (transmission and distribution) investment needs and DER [distributed energy resources] resource alternatives. Beyond resource investments, the DSIP should include the utility's plan for implementing DSP platform and market components in the plan period. The actions proposed in the DSIP should be evaluated via a business plan that includes a benefit-cost assessment, a qualitative assessment of non-quantifiable benefits, and a risk assessment.*

Extending the transactive energy market into the retail domain, the DSP would need to be in an unbiased position in order to optimize across all available distributed energy resources. To eliminate the conflict of interest in using the existing utilities to host the DSP platforms, New York is proposing to move away from cost-of-service regulation toward an outcome-oriented, performance-based regulation.

In performance-based regulation, utility profits are tied to achieving specific goals determined by the regulator. These can be a composite framework of environmental targets, service quality metrics, price caps, reliability goals, or other goals based on related indices. If carefully designed, performance-based metrics can harness the utility profit motive to inspire innovation in targeted areas of public interest. The challenge lies in framing the goals, however, which may include a system of penalties and rewards for under- and over-achievement, respectively, and require extensive financial modeling.[115,116] New York will be looking to the United Kingdom, where performance-based regulation is the basis of the new "Revenues = Incentives plus Innovation plus Outputs" (RIIO) framework. RIIO is a major reform effort to align utility business models with the policy-driven investment required to transition the nation to a low-carbon economy.[117] One potential impact of RIIO of relevance to readers is that it intends over time to diminish and eliminate any bias favoring utility capital investments over operating expenses. This step is important if emissions-reducing demand-side investments by customers are motivated by utility expenses to support assets they will not own. A focus on total expenses assures attention to overall rate levels. New York is exploring this approach with Consolidated Edison's Brooklyn-Queens reliability project.[118]

Whether utility transformation is being advanced by consumer demand (as in Hawaii and Arizona, for instance), by utilities (as in the case of Duke Energy in North Carolina), or by regulators (as in New York and Minnesota),[119] different models will work in different regulatory environments. And although near-term

113 New York Department of Public Service. (2015, February 26). *Case 14-M-0101. Order Adopting Regulatory Policy Framework and Implementation Plan.* Available at: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7b0B599D87-445B-4197-9815-24C27623A6A0%7d

114 Supra footnote 112.

115 Goldman, C. A., Satchwell, A., Cappers, P., & Hoffman, I. M. (2013, April 10). *Utility Business Models in a Low Load Growth/High DG Future: Gazing Into the Crystal Ball?* Presentation Before the Committee on Regional Electric Power Cooperation (CREPC)/State-Provincial Steering Committee (SPSC) Meeting. Lawrence Berkeley National Laboratory. Available at: http://emp.lbl.gov/publications/utility-business-models-low-load-growthhigh-dg-future-gazing-crystal-ball

116 Goldman, C. (2014, September 24). *Utility Regulatory Models: LBNL Technical Assistance Analysis and Tools. Presentation Before DOE OE Electricity Advisory Committee Meeting.* Available at: http://energy.gov/sites/prod/files/2014/10/f18/02d-CGoldman.pdf

117 Fox-Penner, P., Harris, D., & Hesmondhalgh, S. (2013, October). A Trip to RIIO in Your Future? *Public Utilities Fortnightly.* Available at: http://www.brattle.com/system/publications/pdfs/000/004/958/original/A_Trip_to_RIIO_in_Your_Future.pdf?1386706496

118 Whited, M., Woolf, T., & Napoleon, A. (2015, March 9). *Utility Performance Incentive Mechanisms: A Handbook for Regulators.* Synapse Energy Economics, Inc. Available at: http://synapse-energy.com/sites/default/files/Utility%20Performance%20Incentive%20Mechanisms%2014-098_0.pdf

119 GTM Research. (2015). *Evolution of the Grid Edge: Pathways to Transformation: A GTM Research Whitepaper.* Available at: http://www.greentechmedia.com/research/report/evolution-of-the-grid-edge-pathways-to-transformation

modifications to traditional cost-of-service regulation will be appropriate as interim solutions in many markets, thought leaders are converging on a vision of the future utility as a transactive energy platform that will eventually require dramatic changes to the role of the distribution utility.

3.4. Carbon Offsets

A carbon offset is a certificate or credit that is created to represent the reduction of a fixed amount of GHG emissions (generally, one metric ton of CO_2 or CO_2-equivalent) through an activity that is not directly regulated or is supplemental to regulatory requirements. These can be activities that reduce emissions, avoid emissions, or sequester carbon. Offsets are registered, tracked, traded, and retired in a manner similar to the renewable energy credits described in Chapter 16. Offsets can be used to assist in compliance with California's AB-32 requirements, in the European Union's Emissions Trading Scheme, in Clean Development Mechanism (CDM) and Joint Implementation (JI) projects under the United Nations Framework Convention on Climate Change, and in voluntary markets, among other purposes.

The carbon offset concept first arose more than a decade ago to serve the needs of individuals, businesses, and institutions that wanted to voluntarily reduce their contribution to climate change but found that the options to directly reduce their own emissions were limited in amount or unacceptably expensive. Recognizing that other parties often had more potential to reduce emissions and to do so at lower costs, but couldn't afford to or were not so inclined, some early entrepreneurs created carbon offsets as a means to put these two groups together. The buyers of offsets, in effect, finance the sellers' emissions reduction projects. For example, anaerobic digesters installed on dairy farms can capture methane from cow manure, burn it to generate electricity, and reduce GHG emissions. However, anaerobic digesters require a large upfront capital investment, and they can be complicated and expensive to maintain. As a result, few dairy farms in the United States have installed a digester. However, in recent years some farmers have financed digester projects by selling carbon offsets to willing buyers.

Today the market for carbon offsets is no longer limited only to voluntary buyers. Many of the established GHG cap-and-trade programs include provisions allowing for the use of carbon offsets as an alternative to emissions allowances. For example, under the current cap-and-trade rules adopted by the nine Northeast states participating in the Regional Greenhouse Gas Initiative (RGGI), regulated power plants are allowed to meet up to 3.3 percent of their compliance obligation for each control period using CO_2 offset allowances. The RGGI states have thus far limited eligibility for offset allowances to just five project categories, each of which represents a project-based GHG emissions reduction outside of the capped electric power generation sector:

- Landfill methane capture and destruction;
- Reduction in emissions of sulfur hexafluoride in the electric power sector;
- Carbon sequestration in US forests (through reforestation, improved forest management, avoided conversion, or afforestation);
- Reduction or avoidance of CO_2 emissions from natural gas, oil, or propane end-use combustion owing to end-use energy efficiency in the building sector; and
- Avoided methane emissions from agricultural manure management operations.

Additionality requirements apply to all RGGI offset allowances, which means in this specific case that projects are not eligible for offsets if they are funded with utility ratepayer dollars or required under any statute, regulation, or order. A rigorous procedure has been developed for registering and verifying offset allowances. It is notable that no offset allowances had been awarded to any projects as of the end of 2013, in part because the low price of emissions allowances has not encouraged alternative investments.[120]

The state of California has also opted to allow the use of registered and verified offsets for compliance with its GHG cap-and-trade program, but in its case more than 17 million offset credits have already been issued.[121] Regulated entities in California can use offsets to meet up to eight percent of their compliance obligation. Projects in five categories are currently eligible for offset credits if they meet all program requirements:

- US Forest Projects;
- Urban Forest Projects;
- Livestock Projects;

120 Potomac Economics for RGGI. (2014, May). *Annual Report on the Market for RGGI CO_2 Allowances:* 2013. Available at: http://www.rggi.org/docs/Market/MM_2013_Annual_Report.pdf

121 See: http://www.arb.ca.gov/cc/capandtrade/offsets/issuance/arb_offset_credit_issuance_table.pdf

- Ozone Depleting Substances Projects; and
- Mine Methane Capture Projects.

At the international level, the Kyoto Protocol to the United Nations Framework Convention on Climate Change includes two offset programs, the CDM and JI. Countries that committed to limiting GHG emissions under the Kyoto Protocol are allowed to meet some of their commitment by funding and implementing emissions reduction projects in other countries. These projects can earn offset credits representing one metric ton of GHG emissions reductions, which can be counted toward meeting Kyoto Protocol targets. The list of eligible projects is much broader than the five categories approved for use in RGGI.

A CDM or JI project has to meet additionality requirements (i.e., provide emissions reductions that are additional to what would otherwise occur, and not result in the diversion of normal international development assistance). Verification and approval requirements also apply. Since the beginning of 2006, thousands of projects have registered and produced almost 2.5 billion credits.[122] In Europe, where the European Union's Emissions Trading Scheme is used by most countries to comply with Kyoto Protocol commitments, CDM and JI credits can be used for Emissions Trading Scheme compliance purposes by regulated entities.

The voluntary offset market is now much smaller than the markets using offsets for compliance purposes. A recent report on the state of the voluntary market found that it encompassed 102.8 million metric tons of GHG emissions in 2012, and 76 million metric tons in 2013. Most of this decline is attributed to changes in California, where offset projects that had previously been registering credits for voluntary purposes instead began registering for the new, mandatory cap-and-trade program. Even so, the voluntary market in 2013 brought in $379 million for offset projects that reduce GHG emissions.[123] A common criticism of voluntary offsets is that they are not regulated and thus not subject to the same project eligibility, additionality, and verification standards as compliance market offsets. However, several voluntary standards administered by independent third-party verifiers have been introduced in recent years to bring more credibility to this market.

The EPA, in its 111(d) rulemaking, proposed that offsets from outside the US power sector could not be applied to demonstrate compliance by regulated sources. The rationale behind this decision appears to be based on the idea that out-of-sector offsets do not, by definition, reduce power sector emissions and may not be a legal option under the specific language of Section 111 of the Clean Air Act. However, the EPA tried to make clear that programs like the RGGI and California cap-and-trade programs, which allow for the use of offsets, will not run afoul of the regulations so long as the affected EGUs would not exceed their federal 111(d)-based emissions limits. Officials in some states feel that this does not go far enough, and have asked the EPA to afford states more flexibility to use offsets. For example, comments on the proposed rule that were submitted by officials in Kentucky and Georgia recommend that the EPA allow offsets from outside the power sector to be used for compliance.[124]

4. Multi-Pollutant Planning

Most US states require utilities to plan for meeting forecasted annual peak and energy demand, plus an established reserve margin, considering all available supply- and demand-side resource options over a specified future period. Called "integrated resource planning" (IRP) and discussed at length in Chapter 22, such planning is often time- and resource-intensive, but its benefits are great – particularly to consumers. State public utilities commissions typically review and approve IRP plans submitted by utilities.[125]

There is no similarly comprehensive consideration in air

122 Refer to: http://cdm.unfccc.int/index.html and http://ji.unfccc.int/statistics/2015/ERU_Issuance_2015_01_31_1200.pdf

123 Peters-Stanley, M., & Gonzalez, G. (2014). *Sharing the Stage: State of the Voluntary Carbon Markets 2014.* Forest Trends' Ecosystem Marketplace. Available at: http://www.forest-trends.org/documents/files/doc_4841.pdf

124 Refer to pp. 13–14 of the Kentucky cabinet's comments at http://eec.ky.gov/Documents/Ky%20EEC%20111(d)%20Comments%20Nov.%2026,%202014.pdf, and p. 7 of the comments submitted by the Georgia Public Service Commission at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0602-23535

125 Wilson, R., & Biewald, B. (2013, January). *Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans.* Synapse Energy Economics, Inc. for The Regulatory Assistance Project. Available at: www.raponline.org/document/download/id/6608

quality planning that takes into account the multiple public health and welfare threats of various air pollutant emissions and how collectively they might be addressed most cost-effectively and expeditiously. Instead, the Clean Air Act clearly delineates and separates different air pollutants and different ways in which they are to be regulated. This is unfortunate because sources often emit multiple pollutants, and control measures can often be selected that reduce emissions of multiple pollutants simultaneously.

The idea of addressing air quality from a holistic, multi-pollutant perspective is not new. Several papers and books have been written on this topic and several recommendations made for the EPA, state, and local air quality agencies to consider adopting multi-pollutant approaches. Economic models also conclude that reducing multiple air pollutants through root-of-pipe measures (e.g., at the beginning of industrial processes) is far more cost-effective than multiple pollutant-specific approaches focused only at the end of the pipe.[126]

Two influential bodies in fact have recommended that the EPA explicitly enable and encourage states to develop multi-pollutant plans. In 2004, the National Research Council of the National Academies of Science published "Air Quality Management in the United States." This comprehensive assessment identified five major recommendations for the EPA to consider and adopt. Among them were to "transform the [state implementation plan] SIP process into a more dynamic and collaborative performance-oriented, multi-pollutant air quality management planning (AQMP) process" and to "develop an integrated program for criteria pollutants and hazardous air pollutants."[127] In 2010, the Clean Air Act Advisory Committee (CAAAC) developed a framework for a multi-pollutant strategy. The CAAAC's objectives were to align four major Clean Air Act programs: National Emission Standards for Hazardous Air Pollutant Standards (NESHAPS), New Source Performance Standards (NSPS), National Ambient Air Quality Standard (NAAQS), and New Source Review (NSR), and to coordinate – for the affected sources of pollution – the timing and obligations associated with these programs. CAAAC noted, "The Clean Air Act – read according to its express terms and without much of the intervening interpretative gloss of the past four decades – provides sufficient flexibility to achieve these objectives."[128] These recommendations appear even more appropriate with the recent addition of proposed GHG emissions reduction requirements.

The National Academies of Science and CAAAC recommendations anticipate that, done correctly along the lines of an "air quality IRP," states could develop comprehensive plans that meet existing NAAQS, as well as anticipate future NAAQS, hazardous air pollutant standards, and GHG reduction requirements. This concept has been explored further by The Regulatory Assistance Project under the rubric of Integrated Multi-Pollutant Planning for Energy and Air Quality (IMPEAQ).[129] IMPEAQ would identify all measures needed to meet a state's long-term air quality goals. Each time a NAAQS, NSPS, or NESHAP is revised by the EPA, the state would identify, assign, and/or add appropriate elements from its IMPEAQ planning process and incorporate them into the required state implementation plan (SIP) or other compliance plan revision as needed for EPA approval. Unlike IRP as generally practiced in the power sector, IMPEAQ would seek to include "externalities" in air quality decisions (e.g., the societal benefits and costs associated with the adoption and implementation of air quality control measures).

Although the Clean Air Act generally applies a pollutant-by-pollutant approach, it does not restrict states to developing air quality plans that only address one pollutant or that only include measures to reduce a single pollutant. Economic models conclude that the costs to achieve a particular environmental end-point are lower when the selected control measures reduce several pollutants at the

126 James, C., & Colburn, K. (2013, March). *Integrated, Multi-Pollutant Planning for Energy and Air Quality (IMPEAQ)*. Montpelier, VT: The Regulatory Assistance Project. Available at: www.raponline.org/document/download/id/6440

127 National Research Council, Committee on Air Quality Management in the United States. (2004). *Air Quality Management in the United States*. Available at: http://www.nap.edu/catalog/10728/air-quality-management-in-the-united-states

128 Clean Air Act Advisory Committee, Economic Incentives and Regulatory Innovation Subcommittee. (2010, September). *A Conceptual Framework for a Source-Wide Multi-Pollutant Strategy*. Available at: http://www.eli.org/sites/default/files/docs/seminars/10.20.10dc/EPA-Attachment-4.pdf?q=pdf/seminars/10.20.10dc/EPA-Attachment-4.pdf. CAAAC formally advises the EPA on air quality programs and regulatory standards.

129 Supra footnote 126.

same time and when both demand-side measures and end-of-pipe measures are applied. For example, modeling completed by the Bay Area Air Quality Management District for its 2010 Clean Air Plan indicated that public health benefits and reduced damages from climate change in the range of $270 million to $1.5 billion per year could be achieved from a suite of 55 control measures that would jointly reduce criteria, toxic, and GHG pollutants.[130]

Similarly, work using the GAINS model demonstrates that the cost to reduce public health risk by 50 percent over 20 years can be reduced by one-third when the control measures include energy efficiency, combined heat and power, and end-of-pipe controls, as compared to only end-of-pipe controls.[131] The EPA's regulatory impact analysis for the Mercury and Air Toxics Standards also showed that the costs of meeting the mercury standard were $3 to $12 billion lower when energy efficiency was an integral part of the control strategy, and that emissions of SO_2, NO_X, and CO_2 were also lower.[132] Another EPA analysis performed for the cement industry indicated that compliance costs to meet NSPS and NESHAPs would be lower and provide greater environmental benefits if the various regulations were synchronized.[133]

Among US states, Maryland is a leader in advancing multi-pollutant approaches. Working with the Northeast States for Coordinated Air Use Management, the University of Maryland, and Towson University, the Maryland Department of the Environment has leveraged Maryland's 2015 ozone SIP requirements and state-legislated 2012 GHG reduction requirements to build a multi-pollutant analytical framework. The Maryland Department of the Environment's framework allows it to:

- Quantify the emissions reductions of multiple pollutants for a broad suite of energy efficiency and renewable energy efforts;
- Model the reductions in ozone, fine particulate, and other pollutants;
- Estimate the public health benefits associated with those reductions; and
- Quantify the economic benefits and costs.[134]

The Regulatory Assistance Project envisions IMPEAQ as an air quality planning process that builds upon the best components of utility IRP processes and also incorporates environmental, energy, and economic externalities that are not typically included in an IRP. Including externalities and their influence on the cost-effectiveness of control measures – and considering whether and how control measures may have unintended consequences – can help meet both air regulators' goals to attain and maintain compliance with NAAQS and other requirements of the Clean Air Act, and energy regulators' goals to assure reliable and affordable electric and gas service.

5. Conclusion

As noted in the introduction to this document, the EPA's proposed Clean Power Plan establishes state-specific CO_2 emissions standards using four building blocks. These building blocks are intended to reflect the degree of emissions limitation achievable through the application of the best system of emission reduction that the EPA believes has been adequately demonstrated, taking into account the cost of achieving such reductions and any non-air-quality health and environmental impacts and energy requirements.

The proposed CPP does not, however, compel states to use the same four building blocks to meet the state-specific emissions targets. Instead, states are free to identify other options to reduce CO_2 emissions and to submit compliance plans that incorporate any combination of measures in the

130 Bay Area Quality Managment District. (2010, September 15). *2010 Clean Air Plan.* Available at: http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx

131 Bollen, J. C., van der Zwaan, B., Corjan, B., & Eerens, H. (2009). Local Air Pollution and Global Climate Change: A Combined Cost-Benefit Analysis. *Resource and Energy Economics 31;* 161–181. Available at: https://ideas.repec.org/a/eee/resene/v31y2009i3p161-181.html

132 US EPA. (2011, March). *Regulatory Impact of the Proposed Toxics Rule, Final Report (Chapter 8).*

133 Witosky, M. (2010, May 26). *Sector-Based Multi-Pollutant Approaches for Stationary Sources.* Presentation to the Clean Air Act Advisory Committee. US EPA Office of Air Quality Planning and Standards. Available at: http://www.eli.org/sites/default/files/docs/seminars/10.20.10dc/EPA-Attachment-1.pdf?q=pdf/seminars/10.20.10dc/EPA-Attachment-1.pdf

134 Adburn, T. (2013, March 25). *Building Energy Efficiency and Renewable Energy Programs Into the Clean Air Planning Process: Taking Credit for Nontraditional Programs.* Presentation at ACEEE Market Transformation Symposium. Maryland Department of the Environment. Available at: aceee.org/files/pdf/conferences/mt/2013/Tad%20Aburn_D2.pdf

EPA's building blocks, as well as other options that in total reduce CO_2 emissions sufficiently to achieve compliance with the CPP's emissions targets. The broad variety of technology and policy options available for states to consider and incorporate in their CPP compliance plans is evident in the previous 25 chapters of this *Menu of Options* – a breadth that far exceeds the EPA's four building blocks.

This twenty-sixth chapter introduces a variety of rapidly emerging technologies and additional policy opportunities that regulators may wish to consider as they formulate plans to reduce future power sector GHG emissions. With the dramatic evolution underway in the power sector, additional options – some not even conceived today – are likely to become available. Illustration of this rapid evolution is evident in the fact that many of the technologies and policies covered in this *Menu of Options* have advanced significantly during the year of its development and publication.