

Distributed Solar Generation and Net Metering Stakeholder Group
(Solar Stakeholder Group or SSG)

Meeting Notes

May 28, 2014

10:00 a.m. to approximately 3:45 p.m.

At Department of Forestry's Central Regional Office
900 Natural Resources Drive
Charlottesville, VA 22903

Staff members Carol Wampler (Department of Environmental Quality) and Ken Jurman (Department of Mines, Minerals & Energy) opened the meeting with a word of welcome. Attendees introduced themselves and signed attendance sheets (**Attachment 1**).

Damian Pitt, chair of the stakeholder study effort, made a presentation (**Attachment 2**) on previous studies of the costs and benefits associated with distributed solar generation (DSG). The presentation addressed the methodologies, variables, assumptions, and issues to consider when evaluating the costs and benefits of DSG, as identified by or drawn from those previous studies. The presentation was followed by questions and group discussion.

A handout entitled, "Benefit and Cost Variables in Value of Solar Studies," was distributed (**Attachment 3**). On this document, the SSG Steering Committee had divided the issues into three clusters or groups, with Steering Committee members assigned to lead SSG discussion of each group of issues. A grid of issues was also distributed, providing spaces on which the group might record their notes (**Attachment 4**). Dr. Pitt provided an overview of the issues and asked SSG members to divide into three groups, with a balanced representation of stakeholder interests in each group. The three small groups met and discussed their respective issues for approximately 2 ½ hours, including a working lunch.

Participants in the three groups were as follows:

Group I: Energy, Capacity and Grid Support Services

Cliona Robb (chair), Francis Hodsoll, Ron Jefferson, Larry Jackson, Aimee Vosper, Katie Ottenweller, Corrina Beall, Alix Johns, Hugh Stoll, Jon Proffitt, Eric Hurlocker, Tim Buckley, Susan Rubin

Group II: Financial Risk and Security Risk

Rob Marmet (chair), Tony Smith, Howard Spinner, Corey Chamberlain, Sarah Fort, Joe Gruss, Susan Hafeli, Walter McLeod

Group III: Environmental Issues and Economic Development

John Morrill (chair), Monique Hanis, Bill Murray, Matt Ruscio, David Hudgins, Larry Land, Dawone Robinson, Kate Rooth, Jordan Hollinger

Following these discussions, a representative of each group presented the group's ideas (**Attachment 5**)

Dr. Pitt led the group's consideration and discussion of the draft SSG Work Plan (**Attachment 6**), as amended by the Steering Committee. SSG members suggested that a telephone call to NREL be added to the Work Plan, to occur within the next few weeks. Otherwise, SSG members expressed no objections to the Plan. It was noted that the Work Plan may be amended if circumstances change over time.

Ken Jurman will arrange the NREL call, in cooperation with selected SSG members, and in a manner consistent with FOIA requirements.

The next meeting of the SSG plenary group will be held at DOF's Charlottesville office on June 26, beginning at 10:00 a.m. There will be presentations on potential solar opportunities and challenges in non-jurisdictional markets at the federal, state, and local levels, and a presentation on implications of the draft Clean Air Act §111(d) federal greenhouse gas regulations. It is anticipated that much of the day will be devoted to work on the study, facilitated by Dr. Pitt with assistance from members of the Steering Committee.

*Future Full SSG Meetings (scheduled but subject to change) at DOF in Charlottesville:
June 26, July 22, August 21; others TBD*

*Future Steering Committee Meetings (some may be canceled if not needed):
June 20, Fredericksburg; July 10, Richmond; July 18, Fredericksburg; August 6, Richmond; August 12, Fredericksburg*

Distributed Solar Generation and Net Metering Stakeholder Group

("Solar Stakeholder Group")

Attendance Roster

Meeting Date: May 28, 2014

Location: Department of Forestry Headquarters, Charlottesville, VA

Please check off your name and write your initials to the side. If your name is not listed, please sign in spaces provided at the end of the roster.

Utilities:

- Ron Jefferson, Appalachian Power *RJG*
- Larry Jackson, Appalachian Power - Alternate *LJ*
- Susan Rubin, ~~Old Dominion Electric~~ Cooperatives (ODEC) *SR* + Assoc of Elec Co-ops
- David Hudgins, ODECC *DH*
- Howard Spinner, Northern Virginia Electric Cooperative (NOVEC) *HS*
- Gil Jaramillo, NOVEC - Alternate
- Tim Martin, Rappahannock Electric Cooperative (REC)
- Matt Faulconer, REC - Alternate *MAF*
- Bill Murray, Dominion *BM*
- Tim Buckley, Dominion *TGB*

Municipal Government:

- John Morrill, Arlington *JM*
- Jeannine Altavilla, Arlington - Alternate
- Aimee Vosper, Northern Virginia Regional Commission *AV*
- Steve Walz, Metropolitan Washington Council of Governments (MWCOG)
- Jeff King, MWCOG - Alternate
- Larry Land, VACOL *LL*
- Carol Davis, Blacksburg *CD*
- Joe Gruss - ALTERNATE *JG*
- Joe Lerch, Virginia Municipal League

Academia:

- John Randolph, Virginia Tech
- Damian Pitt, Virginia Commonwealth University (VCU)
- Gilbert Michaud, VCU – Alternate
- Dr. Jonathan Miles, James Madison University
- Mike Zimmer, Thompson Hine (retired); Ohio University

State Government:

(STAFF)

- Carol Wampler, Department of Environmental Quality *new*
- Ken Jurman, Department of Mines, Minerals and Energy (DMME) *LSJ*
- Al Christopher, DMME

Trade Associations:

- Andrew Smith, Farm Bureau
- Cliona Robb, Virginia Energy Purchasing Governmental Association (VEPGA) *CUR*
- Susan Hafeli, VEPGA *Smk*

Citizen:

- Monique Hanis, Citizen Stakeholder from Arlington *MH*

Industry:

- Scott Sklar, The Stella Group, Ltd. and George Washington University
 - Tony Smith, Secure Futures, LLC *MS*
 - Matt Ruscio, Secure Futures, LLC - Alternate *MCR*
 - Hugh Stoll, Secure Futures, LLC - Alternate *Has*
 - Ken Schaal, Commonwealth Solar
 - J. Patrick Bixler - BaselineSolar
 - Matthew Meares, SunWorks
 - Mike Healy, Skyline Innovations
 - Francis Hodson, Virginia Advanced Energy Industries
 - Kimberly V. Davis, MDV-SEIA, Virginia Committee
 - Kevin S. Comer, Antares Group Inc.
 - David Zachow, Direct Connect Solar and Electric
 - Jim Pierobon, Pierobon & Partners LLC Jon Hillis, Prospect Solar
 - Walter McLeod, Eco Capitol Companies, LLC *Wm*
- ~~JOHN HODSON~~*
~~SECURE FUTURES INTERN~~

NGO/Conservation Groups:

- Ivy Main, Sierra Club
- Corrina Beall, Sierra Club - Alternate
- Rob Marmet, Piedmont Environmental Council *LM*
- Dawone Robinson, Chesapeake Climate Action Network *DR*
- Chelsea Harnish, Virginia Conservation Network
- Hannah Wiegard, Appalachian Voices
- Kate Rooth, Appalachian Voices - Alternate *KR*
- Dan Conant - Community Power Network
- ~~Angela Navarro~~ Angela Navarro - Southern Environmental Law Center (SELC)
- Katie Ottenweller - SELC alternate *KOO*
- Jon Proffitt, Program Manager, Charlottesville Local Energy Alliance *JP*

Attorney:

- Eric W. Hurlocker, GreeneHurlocker, PLC *EW*

Additional Attendees:

Name Corey Chamberlain
Organization Dominion

Name Jordan Hollinger
Organization Secure Futures

Name Sarah Fort
Organization Southern Environmental Law Center

Name Alix John
Organization Electrical Distribution Design, Inc.

Name _____
Organization _____

Name _____
Organization _____

Examining the Costs and Benefits of Distributed Solar Generation and Net Metering

Solar Stakeholder Group (SSG)

May 2014

Introduction

- How have existing studies approached the costs and benefits of distributed solar (DSG)?
- What issues must be considered in selecting an appropriate methodology?
- What variables are used in the analysis?

History

- As DSG becomes more prevalent, stakeholders are becoming increasingly interested in examining the costs and benefits of DSG.
- Several recent reports, with many differences
 - Perspectives
 - Assumptions
 - Methodologies
 - Conclusions

Previous Studies

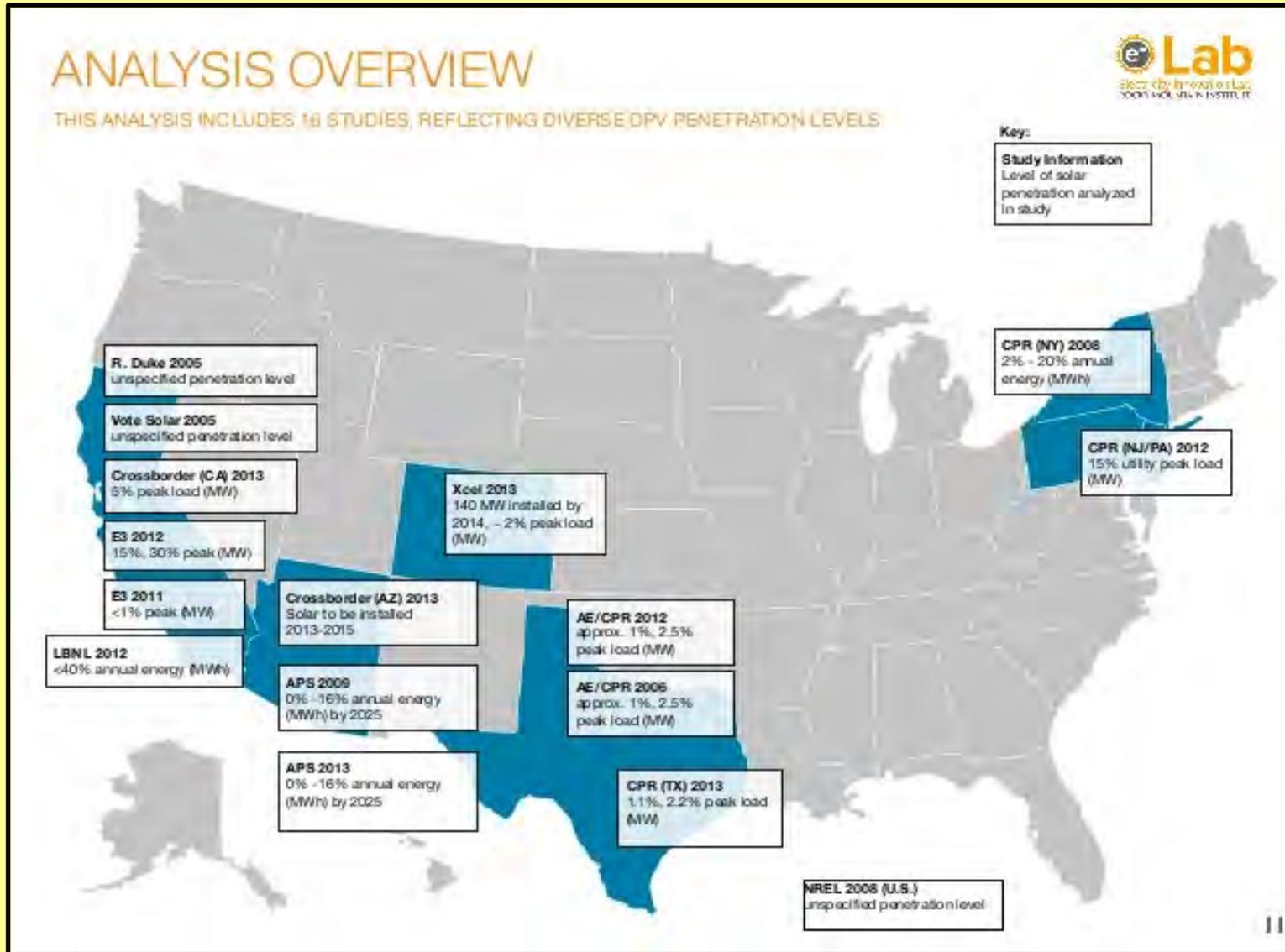
- Most by research and consulting firms, for utilities, state agencies and solar organizations
 - Clean Power Research
 - Crossborder Energy
 - Energy & Environmental Economics (E3)
- Others by state agencies and academics
- Existing studies for: AZ, CA, CO, MA, MN, NJ, NY, NV, PA, TX, and VT
- Other states undergoing or discussing similar studies: FL, GA, IA, LA, MI, OR, SC and VA

Methodologies

- Cost / benefit analyses: Evaluate costs and benefits over a specific period of time (E3 and Crossborder Energy reports)
- Value of solar studies: Analyze future investment value of DSG to utilities, ratepayers and society; costs not addressed (CPR reports)
- Meta-analyses: Summarize other reports and present differences in assumptions, methodologies and data (IREC and RMI reports)

For a comparison of methodology and included costs and benefits see page 9 of Public Service Department. (2013). *Evaluation of net metering in Vermont conducted pursuant to act 125 of 2012*

Rocky Mountain Institute. (2013). *A review of solar pv benefit & cost studies.*



Standardized Approaches

- Keyes, J. B., & Rabago, K. R. Interstate Renewable Energy Council, (2013). *A regulator's guidebook: Calculating the benefits and costs of distributed solar generation.*
- Keyes, J. B., & Wiedman, J. F. Interstate Renewable Energy Council, Solar America Board for Codes and Standards. (2012). *A generalized approach to assessing the rate impacts of net energy metering.*

Types of Cost/Benefit Analyses

- **Participant Cost Test ("PCT")**. Measures benefits and costs to program participants.
- **Ratepayer Impact Measure ("RIM") Test**. Measures changes in electric service rates due to changes in utility revenues and costs resulting from the assessed program.
- **Program Administrator Cost Test ("PACT")**. Measures the benefits and costs to the program administrator, without consideration of the effect on actual revenues. This test differs from the RIM test in that it considers only the revenue requirement, ignoring changes in revenue collection, typically called "lost revenues."
- **Total Resources Cost Test ("TRC")**. Measures the total net economic effects of the program, including both participants' and program administrator's benefits and costs, without regard to who incurs the costs or receives the benefits. For a utility-specific program, the test can be thought of as measuring the overall economic welfare over the entire utility service territory.
- **Societal Cost Test ("SCT")**. The SCT is similar to the TRC, but broadens the universe of affected individuals to society as a whole, rather than just those in the program administrator territory. The SCT is also a vehicle for consideration of non-monetized externalities, such as induced economic development effects, which are not considered in the TRC.

(Source: IREC, 2013).

Recall Senate Resolution No. 47

To “convene a stakeholder group to *study the costs and benefits of distributed solar generation and net metering*...The stakeholder group shall examine data relevant to determining the costs and benefits of interconnected distributed solar generation, recommend a method for evaluating such data, and consider other issues as it may deem appropriate.”

What Is Our Purpose/Perspective?

Stakeholder Perspectives Regarding Value of Distributed Solar Generation

Stakeholder Perspective		Factors Affecting Value
PV CUSTOMER	"I want to have a predictable return on my investment, and I want to be compensated for benefits I provide."	Benefits include the reduction in the customer's utility bill, any incentive paid by the utility or other third parties, and any federal, state, or local tax credit received. Costs include cost of the equipment and materials purchased (inc. tax & installation), ongoing O&M, removal costs, and the customer's time in arranging the installation.
OTHER CUSTOMERS	"I want reliable power at lowest cost."	Benefits include reduction in transmission, distribution, and generation, capacity costs; energy costs and grid support services. Costs include administrative costs, rebates/ incentives, and decreased utility revenue that is offset by increased rates.

Source: Sanders, R. G., & Milford, L. Clean Energy Group, (2014). *Clean energy for resilient communities: Expanding solar generation in Baltimore's low-income neighborhoods.*

What Is Our Purpose/Perspective?

Stakeholder Perspectives Regarding Value of Distributed Solar Generation

Stakeholder Perspective		Factors Affecting Value
UTILITY	"I want to serve my customers reliably and safely at the lowest cost, provide shareholder value and meet regulatory requirements."	Benefits include reduction in transmission, distribution, and generation, capacity costs; energy costs and grid support services. Costs include administrative costs, rebates/ incentives, and decreased revenue.
SOCIETY	"We want improved air/water quality as well as an improved economy."	The sum of the benefits and costs to all stakeholders, plus any additional benefits or costs that accrue to society at large rather than any individual stakeholder.

Source: Sanders, R. G., & Milford, L. Clean Energy Group, (2014). *Clean energy for resilient communities: Expanding solar generation in Baltimore's low-income neighborhoods.*

Key Benefit Variables in C&B Analyses and Value of Solar Studies

Direct Financial Benefits to Utilities	Indirect Financial Benefits to Utilities	Benefit to Ratepayers / General Population
Energy	Fuel Price Hedge	Social
Generation Capacity	Market Price Response	* Environmental
T&D Capacity	Security	
Grid Support Services		
System Losses		
* Environmental	Source: Gruss, J. (2014). <i>Lessons learned from regional value of solar studies.</i>	

- For additional information on variable specifics Solar Electric Power Assoc. (2013). *Ratemaking, solar value and solar net energy metering — a primer.*
- Role of Clean Power Research DGValuator Tool:
<http://www.cleanpower.com/consulting/dgvaluator/>

Key Cost Variables in C&B Analyses

- Lost retail rate revenues
- Integration and administrative costs
- DSG incentives
- T&D investments
- Increased electricity prices
- Net metering bill credits
- Rate structure impacts
- Solar penetration costs

This report also has a great descriptive chart for values of DSG: Contreras, J. L., Frantzis, L., Blazewicz, S., Pinault, D., & Sawyer, H. Navigant Consulting Inc., Prepared for the National Renewable Energy Laboratory. (2008). *Photovoltaics value analysis*.

Common Study Assumptions

- Natural gas price forecast is most critical assumption to determine future energy value
- PV systems experience 0.5% degradation per year
- PV not assumed to replace current baseload generation but rather defer or displace future generation needs
- DSG can be installed with shorter lead times and wider variety of sites than centralized generation
- Societal benefits of DSG should be included

IREC Report – Issues to Consider

- What form of generation does DSG displace (peaking CT or CCGT plants)?
- How and when does expanded DSG capacity displace centralized capacity (“lumpiness” issue)?
- How are T&D costs and benefits calculated?
- How are marginal benefits evaluated (if at all)?
 - Ancillary grid support services
 - Fuel price hedge value
 - Market price response
 - Grid reliability and resiliency benefits
- How is lost utility revenue addressed?
- How are societal benefits measured?

Additional Specific Issues

- Timeframe: Snapshot, or useful lives of systems?
- What level of DSG market penetration is assumed?
- How minimal or constant is load growth uncertainty?
- What are assumed future fuel costs?
- What discount rate is used?
- Is the study considering all generation, or only exports?
- How are future load shapes determined?
- Are the costs and benefits levelized (at 20 or 30 years)?
- What is the level of granularity of available data?
- Are the inputs publicly available?
- How often should proxy data be used?

Conclusion: Four Big Questions

- Which type of study are we doing?
 - Ratepayer Impact? Societal Cost? Both? Other?
- Divergence/convergence from previous studies?
- What potential cost and/or benefit variables should be included?
- What data is viable to gather in our timeframe?

Questions?

Benefit and Cost Variables in Value of Solar Studies

For Small-Group Discussions – led by Damian Pitt and SSG Steering Committee Members
Solar Stakeholder Group Meeting
May 28, 2014

Adapted from “A Review of Solar PV Benefit and Cost Studies” (April 2013). Rocky Mountain Institute Electricity Innovation Lab. Available at www.rmi.org/elab_emPower.

GROUP I: Energy, Capacity, and Grid Support Services: Discussion led by Francis Hodsoll, Ron Jefferson, Angela Navarro, Cliona Robb (captain)

ENERGY

- Avoided energy. “The cost and amount of energy that would have otherwise been generated to meet customer needs, largely driven by the variable costs of the marginal resource that is displaced.”
- Energy losses: “The value of the additional energy generated by central plants that would otherwise be lost due to inherent inefficiencies (electrical resistance) in delivering energy to the customer via the transmission and distribution system.”

CAPACITY

- Generation capacity: “The cost of the amount of central generation capacity that can be deferred or avoided due to DPV” (DPV = distributed PV).
- Transmission & distribution capacity. “The value of the net change in T&D infrastructure investment due to DPV. Benefits occur when DPV is able to meet rising demand locally, relieving capacity constraints upstream and deferring or avoiding T&D upgrades.”

GRID SUPPORT SERVICES

“Grid support services, which encompass more narrowly defined ancillary services (AS), are those services required to enable the reliable operation of interconnected electric grid systems.” This includes

- Reactive supply & voltage control
- Regulation & frequency response
- Energy & generator imbalance
- Synchronized & supplemental operating reserves
- Scheduling, forecasting, and system control & dispatch

GROUP II: Financial Risk and Security Risk: Discussion led by Rob Marmet (captain), Tony Smith, Howard Spinner, Steve Walz

FINANCIAL RISK

- Fuel price hedge. “The cost that a utility would otherwise incur to guarantee that a portion of electricity supply-costs are fixed.”
- Market price response. “The price impact as a result of DPV’s reducing demand for centrally-supplied electricity and the fuel power those generators, thereby lowering electricity prices and potentially commodity prices.”

SECURITY RISK

“Security value of DPV is positive when grid reliability and resiliency are increased by (1) reducing outages by reducing congestion along the T&D network, (2) reducing large-scale outages by increasing the diversity of the electricity system’s generation portfolio with smaller generators that are geographically dispersed, and (3) providing back-up power sources available during outages through the combination of PV, control technologies, inverters and storage.”

GROUP III: Environmental and Economic Development: Discussion led by Monique Hanis, John Morrill (captain), Bill Murray, Matt Ruscio

ENVIRONMENTAL

- Carbon emissions. “The value from reducing carbon emissions is driven the emission intensity of displaced marginal resource and the price of emissions.”
- Criteria air pollutants (SO_x, NO_x, PM₁₀). The value from reducing criteria air pollutant emissions—NO_x, SO₂, and particulate matter—is driven by the cost of abatement technologies, the market value of pollutant reductions, and/or the cost of human health damages.
- Water. “The value from reducing water use is driven by the differing water consumption patterns associated with different generation technologies, and can be measured by the price paid for water in competing sectors.”
- Land. “The value associated with land is driven by the difference in the land footprint required for energy generation and any change in property value driven by the addition of DPV.”

ECONOMIC DEVELOPMENT

“Social value of DPV is positive when DPV results in a net increase in jobs and local economic development. Key drivers include the number of jobs created or displaced, as measured by a job multiplier, as well as the value of each job, as measured by average salary and/or tax revenue.”

Value Stream	Description*	Suggested Approach and Relevant Source Material
Avoided Energy	The cost and amount of energy that would have otherwise been generated to meet customer needs, largely driven by the variable costs of the marginal resource that is displaced. In addition to the coincidence of solar generation with demand and generation, key drivers of avoided energy cost include (1) fuel price forecast, (2) variable operation & maintenance costs, and (3) heat rate.	
System Losses	The compounded value of the additional energy generated by central plants that would otherwise be lost due to inherent inefficiencies (electrical resistance) in delivering energy to the customer via the transmission and distribution system. Since DPV generates energy at or near the customer, those losses are avoided. Losses act as a magnifier of value for capacity and environmental benefits, since avoided energy losses result in lower required capacity and lower emissions.	
Generation Capacity	The cost of the amount of central generation capacity that can be deferred or avoided due to the addition of DPV. Key drivers of value include (1) DPV's effective capacity and (2) system capacity needs.	
Transmission & Distribution Capacity	The value of the net change in T&D infrastructure investment due to DPV. Benefits occur when DPV is able to meet rising demand locally, relieving capacity constraints upstream and deferring or avoiding T&D upgrades. Costs occur when additional T&D investment is needed to support the addition of DPV.	
Reactive Supply and Voltage Control	Generation facilities used to supply reactive power and voltage control.	
Frequency Regulation	Control equipment and extra generating capacity necessary to (1) maintain frequency by following the moment-to-moment variations in control area load (supplying power to meet any difference in actual and scheduled generation), and (2) to respond automatically to frequency deviations in their networks. While the services provided by regulation service and frequency response service are different, they are complementary services made available using the same equipment and are offered as part of one service.	
Energy Imbalance	This service supplies any hourly net mismatch between scheduled energy supply and the actual load served.	
Operating Reserves	Spinning reserve is provided by generating units that are on-line and loaded at less than maximum output, and should be located near the load (typically in the same control area). They are available to serve load immediately in an unexpected contingency. Supplemental reserve is generating capacity used to respond to contingency situations that is not available instantaneously, but rather within a short period, and should be located near the load (typically in the same control area).	

Scheduling/Forecasting	Interchange schedule confirmation and implementation with other control areas, and actions to ensure operational security during the transaction.	
Fuel Price Hedge	The cost that a utility would otherwise incur to guarantee that a portion of electricity supply costs are fixed.	
Market Price Response	The price impact as a result of DPV's reducing demand for centrally-supplied electricity and the fuel that powers those generators, thereby lowering electricity prices and potentially commodity prices.	
Security Risk	Security value of DPV is positive when grid reliability and resiliency are increased by (1) reducing outages by reducing congestion along the T&D network, (2) reducing large-scale outages by increasing the diversity of the electricity system's generation portfolio with smaller generators that are geographically dispersed, and (3) providing back-up power sources available during outages through the combination of PV, control technologies, inverters and storage.	
Carbon	The value from reducing carbon emissions is driven by the emission intensity of displaced marginal resource and the price of emissions.	
Criteria Air Pollutants	The value from reducing criteria air pollutant emissions—NOX, SO2, and particulate matter—is driven by the cost of abatement technologies, the market value of pollutant reductions, and/or the cost of human health damages.	
Water	The value from reducing water use is driven by the differing water consumption patterns associated with different generation technologies, and is sometimes measured by the price paid for water in competing sectors.	
Land	The value associated with land is driven by the difference in the land footprint required for energy generation and any change in property value driven by the addition of DPV.	
Avoided RPS Costs	The value derived from meeting electricity demand through DPV, which reduces total demand that would otherwise have to be met and the associated renewable energy that would have to be procured as mandated by an RPS.	

Economic Development	The studies reviewed in this report defined social value in economic terms. The social value of DPV was positive when DPV resulted in a net increase in jobs and local economic development. Key drivers include the number of jobs created or displaced, as measured by a job multiplier, as well as the value of each job, as measured by average salary and/or tax revenue.	
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* From RMI "Review of Solar PV Benefit & Cost Studies"

Solar Stakeholder Group (SSG)
 Group 1 Meeting Notes
Energy, Capacity, and Grid Support Services

May 28, 2014

- 1) Principles: Group 1 proposes the following principles
 - a) PJM market structure and economics define how to evaluate energy, capacity, ancillary services, etc.
 - b) Utilize market pricing wherever possible

- 2) Energy value
 - a) Definitions from SELC
 - i) Avoided energy. “The cost and amount of energy that would have otherwise been generated to meet customer needs, largely driven by the variable costs of the marginal resource that is displaced.”
 - ii) Energy losses: “The value of the additional energy generated by central plants that would otherwise be lost due to inherent inefficiencies (electrical resistance) in delivering energy to the customer via the transmission and distribution system.
 - b) Group 1 proposes to include transmission losses in the quantity of energy being valued
 - c) Group 1 proposes to create a weighted average price using 8760 hours energy price projection for the state or region weighted by the 8760 hourly NREL solar generation profile
 - i) Price projections based on either electricity futures pricing or natural gas futures pricing and a historical heat rate.
 - ii) Issue with electricity future is liquidity of market data
 - iii) Issue with natural gas futures and heat rate is not static
 - iv) Both sets of market data provide monthly averages which will need to be adjusted into the hours of the month. The electricity futures contract splits the week into “on-peak” and “off-peak”
 - d) Group 1 will evaluate the use of 2 zones – summer peak and winter peak
 - e) Group 1 proposes to factor in placeholder for battery technology

- 3) Capacity value
 - a) Group 1 proposes to start with the PJM three year capacity market capacity prices
 - b) Group 1 proposes to use CONE (Cost of New Entry) to project out capacity value
 - c) Group 1 will research whether EIA provides the data for CONE
 - d) Group 1 proposes to utilize the NREL generation profile to determine the amount of energy generated during the PJM five non-coincident peaks and value that capacity utilizing the methodology PJM utilizes for calculating capacity.

- e) Group 1 will assess if IRP data can be used to evaluate the value of capacity. Utilities will provide IRP information and access to analysts

- 4) Distribution line losses
 - a) Group 1 debated but did not come to a conclusion on the issue of how much line loss occurs when power flows back onto the grid.
 - b) Power flowing back onto the grid flows through at least two transformers
 - c) Group 1 agreed that power flowing back does not create the same losses as power flowing from the wholesale meter to the retail meter
 - d) Group 1 will continue to assess this issue

- 5) Transmission
 - a) Utilize the PJM transmission rate and the energy during the measured peak for transmission
 - b) How to escalate the PJM transmission rate?

- 6) Ancillary services and imbalance charges have not been determined

Group II Notes: Financial Risk and Security Risk

Participants:

Rob Marmet, Piedmont Environmental Council
Cory Chamberlain, Dominion Virginia Power
Howard Spinner, Northern Virginia Electric Cooperative
Sarah Fort, Southern Environmental Law Center
Joe Gruss, Town of Blacksburg
Susan Hafeli, Fairfax County
Walter McLeod, Eco Capital Investments
Tony Smith, Secure Futures

Discussion:

I. Scope of “distributed generation”

- Includes both residential and commercial/industrial installations
- May include solar installations that are paired with other technologies – ie storage, DSM
- Need to determine definition that is both applicable today and nimble enough to take into account changing technology

II. Fuel Price Hedge

- Premise is that distributed solar generation displaces last generation asset dispatched—usually fueled by natural gas
- Solar has no fuel cost
- All in agreement that this is a benefit of solar
- Components of the hedge:
 - o Variability in fuel costs
 - o Risk of environmental regulation
 - Fracking
 - Carbon
 - o Costs of installing natural gas capacity
 - Enhanced delivery system infrastructure
 - o Size of the hedge depends on certain variables – ie uncertainty of solar supply—if solar unavailable it is not effective as a hedge
 - o Additional technologies have the capability to aid/enhance the hedge

III. Market Price Response

- Basic idea
 - o By reducing load, reduce the marginal price of energy

- By reducing load, also lowers the price of the commodities themselves (especially at increased penetrations)
- Technology enhancements could impact the size of this reduction
- Remaining questions
 - o Could be seen as just a transfer, not an actual efficient gain
 - o Might cause impact on retail prices
 - o May cause under recovery of utility asset costs

IV. Security Risk

- Current DSG has limited security benefit-for safety reasons, PV is turned off when the distribution system is unavailable
- Grid-tied islanding capability
 - o Provides benefit to communities
 - o Black start capability – benefit to utilities
 - o Benefits to campuses (military, university, hospitals, airports)
- Possibility of reduced outages by freeing up T&D in congested areas
- Benefits in reducing vulnerability to cyber-security attacks? Or would more complex system be more susceptible
- Solar inverters could provide grid support services

Group III Notes from the Small Group Session on key issues and topics relating to Environment and Economic Development Issues

Small Group Participants:

Monique Hanis, citizen
Jordan Hollinger, Secure Futures LLC
David Hudgins, Old Dominion Electric Cooperative
Larry Land, Virginia Association of Counties
John Morrill, Arlington County
Bill Murray, Dominion Virginia Power
Dawone Robinson, Chesapeake Climate Action Network
Kate Rooth, Appalachian Voices
Matthew Ruscio, Secure Futures LLC

Following guidance from the Steering Committee, a small group met for about two hours over lunch to identify and discuss key topics to be included in a net value of solar study, including potential sources of data for these topics and metrics for such a study.

Environment

Carbon.

The group agreed that avoided carbon emissions should be valued. There are several approaches to valuing carbon, ranging from the Regional Greenhouse Gas Initiative (RGGI) in the northeast U.S. with auction pricing in the \$3-\$5 per tons of CO₂, to utility carbon price assumptions in recent Integrated Resource Plans, to the U.S. EPA's [Social Cost of Carbon](#) estimates (\$39 per ton of CO₂ in 2015, assuming a 3% discount rate). The group further agreed that the EPA's upcoming rules concerning greenhouse gas emissions from existing power plants under Section 111d of the Clean Air Act will provide valuable guidance toward pricing carbon.

Criteria Air Pollutants.

The group agreed that reductions in Clean Air Act criteria air pollutants (e.g. SO_x, NO_x, particulate matter) should be included and valued, and that there are ample studies from around the U.S. on the value of reductions in these health hazards. It was agreed that the public human health impacts of reduced air pollution are included in this category.

The group further noted that the Richmond and Tidewater regions flirt with noncompliance with the Clean Air Act. There may be additional value in identifying the benefits (avoided costs) of regional compliance if widespread distributed solar PV helps a region meet CAA statutes.

Land / Property.

The group discussed land conservation and impacts of distributed solar, but after clarity that the present work is not addressing utility-scale PV installations, most discussion of land issues switched to property, presuming rooftop installations or small backyard installations. Estimates of the resale value of solar PV on private property is beginning to emerge in research literature, see <http://emp.lbl.gov/sites/all/files/lbnl-6484e.pdf>

Reclamation of former mining sites (and other previously disturbed land sites no longer suitable for development) may be feasible for large PV.

The net value of solar on property will depend in part on the state and local decisions concerning tax assessment of solar installations on real property (some jurisdictions do not tax solar equipment). The opportunity cost if a central power generation plant is not built are localized in one place, whereas the appraisal value of properties with solar PV are widely dispersed.

Regarding individual zoning, historic preservation, and related local decisions, the group agreed to assume best practices are utilized to minimize these impacts on solar siting and placement.

Water.

Similar to criteria air pollutants, the group agreed that there are studies from around the country that can provide data concerning the value of water prices, costs, and usage at power plants that may be deferred or avoided from use of solar.

There is a new (imminent?) state water commission study ("316b") that will inform Virginia-specific values in this area.

Economic Development

The group agreed that employment and related economic development impact of widespread solar PV deployment is important to include in the methodology for a net value of solar study. The National Renewable Energy Laboratory (NREL) has an analytical tool, [JEDI \(Jobs and Economic Development Impact model\)](#) that can be used to estimate these macroeconomic impacts.

Also, the net change in tax revenue by localities should be considered, including both any lost taxes from power plants not built due to widespread solar, as well as tax revenues resulting from increased property assessments where solar is present. This economic development aspect should be coordinated with related analyses on the impact of solar on *Land*, addressed above under **Environment**.

There was considerable discussion of harder-to-quantify intangibles associated with innovation, along the lines of “What is the value of being known as a sustainable state?” and “Can a strong clean energy economy attract businesses that would not otherwise choose Virginia?”

For example, current hurdles to investment in solar in Virginia means the state is likely missing out on installations of solar by corporations (and the U.S. military) meeting their sustainability, cost management and energy reliability goals by installing solar on their properties in other states.

Draft Work Plan: Solar Energy Costs and Benefits Study

Distributed Solar Generation and Net Metering Stakeholder Group
(hereafter “Solar Stakeholder Group” or “SSG”)

As accepted by SSG Plenary Group on May 28, 2014

May 20, 2014

General Statement of Task

For a stakeholder group, convened by DMME and DEQ, to “study the costs and benefits of distributed solar generation and net metering” [by] “exam[in]g data relevant to determining the costs and benefits of interconnected distributed solar generation, recommend[ing] a method for evaluating such data, and consider[ing] other issues as it may deem appropriate.”

(Paraphrased from Senate Resolution No. 47, which was withdrawn from consideration by 2014 Virginia General Assembly at the request of the patron, and later referenced in letter to DMME Director Conrad Spangler from Clerk of the Senate on March 13, 2014. Full letter is attached.)

Anticipated Deliverables

The Solar Stakeholder Group (SSG) will study the net costs and benefits of distributed solar energy to ratepayers and society in Virginia. It will summarize its findings in a report, hereafter referred to as the “net value of solar report” or “report.” The report will briefly discuss the background and context for evaluating solar energy in Virginia, summarize existing studies of the value of distributed solar energy, and discuss how the methodologies and findings of those prior studies could apply in the context of Virginia. The report will recommend one or more methodologies for calculating the costs and benefits and determining the net value of distributed solar energy to ratepayers and society in Virginia. The report will represent, where possible, a consensus of all stakeholders represented by the SSG. On issues where consensus cannot be reached, the report will summarize the various stakeholder positions and the rationales behind them.

The report must be completed and submitted on or before November 1, 2014, as prescribed in the letter study request.

Intended Audience

DMME and DEQ staff will submit the report to Senator John Edwards, chairman of the Senate Rules Committee, and to the Senate Clerk’s Office. The report will be a public document, available to the full Virginia General Assembly, state agencies, and members of the public. It is anticipated that DMME and DEQ will make the report available on their agency websites, just as they will other final documents produced as part of the study.

Role of SSG Steering Committee

In response to the letter study request, DMME and DEQ posted a notice in the Regulatory Town Hall asking individuals who were interested in participating in the study to contact Ken Jurman of DMME by April 30 (see attached public notice). Because a large number of well-qualified individuals responded to the public notice, the SSG includes 49 members, plus alternates (see attached SSG roster). DMME and DEQ approved the membership of the SSG and a steering committee. The steering committee is composed of a balanced representation from the various stakeholder groups (see attached Steering

Committee roster). The SSG steering committee will prepare issues for consideration by the full SSG so that it will be logistically possible for all SSG members to participate in the study in a meaningful fashion. Under the leadership of Dr. Damian Pitt of VCU, the Steering Committee will perform functions such as the following:

- Compiling, analyzing, and summarizing existing studies
- Framing key issues
- Gathering and analyzing relevant data
- Preparing drafts of data analysis and written content for the value of solar report

Dr. Pitt and members of the steering committee will convey the steering committee's preliminary work to the full SSG for discussion and consideration. They will also prepare the initial draft of the value of solar report and then complete a final draft that incorporates feedback from the full SSG. As noted above, the value of solar report will summarize the conclusions, areas of agreement and disagreement, and other information relevant to the letter study request, as agreed on by the full SSG.

Key Process Elements (Tentative)

1. Public Notice in Regulatory Town Hall that DMME/DEQ are convening stakeholder group to study solar issues
2. Approval by DMME & DEQ of plenary group members and steering committee from list of stakeholders who responded to public notice
3. Preliminary work by steering committee to identify issues to address in value of solar report
4. Discussion and consideration by full SSG of issues and recommendations identified by steering committee
5. Interim report drafted primarily by steering committee, after full SSG input
6. Final report:
 - Drafted by steering committee with clerical assistance from DMME & DEQ staff if needed
 - Reviewed and approved by full SSG
 - Reviewed by NREL via technical assistance program
 - Reviewed by DMME & DEQ regarding format, structure, and consistency with request
 - Submitted to Senate Rules Chairman Edwards and Senate Clerk's Office by Nov. 1, 2014

Progress to Date

1. Public Notice posted on Town Hall
2. DMME & DEQ approved SSG members and steering committee – members notified by agency staff
3. Full SSG meeting held on April 28, 2014
 - 45 people in attendance
 - Presentations on GIS mapping technology, impacts of distributed solar generation on utilities, and existing studies of solar valuation across US
 - Group members' nomination of representatives from their respective sectors to serve on steering committee

4. Steering committee established and first meeting scheduled

Proposed Work Plan

Subject to continuing review and updates by steering committee, DMME, DEQ, and full SSG.

- May 20: Steering committee meeting at DEQ's Piedmont Regional Office. Agenda items to include:
1. Hear presentation by VCU PhD candidate, summarizing key studies on costs and benefits of distributed solar (likely to incorporate studies referenced in VT grad student's previous presentation)
 2. Define key study issues
 3. Determine which steering committee members will lead break-out groups' discussion of each of these key issues at May 28 plenary meeting
 4. Schedule steering committee meetings for June – probably 2 “all day” work sessions, to consider results of plenary discussions and identify methodologies for valuing solar in Virginia
 5. Review and edit this tentative work plan, in preparation for further consideration by DMME, DEQ and full SSG
- May 28: Full SSG meeting at DOF's Charlottesville facility; led by Dr. Pitt. Agenda items to include:
1. Presentation of methodologies and key issues / assumptions from existing value of solar studies
 2. Review of key study issues, as framed by steering committee (Amendments to this list of issues, if needed)
 3. SSG members' discussion of key study issues, in small groups led by steering committee members. (Steering committee members will be prepared to share information related to each issue from previous studies.)
 4. Report-out to plenary group of each small group's discussion
 5. Review by plenary SSG of tentative work plan
- Late June: Steering committee work sessions. Suggested tasks referenced above. Meeting dates and locations TBD. Led by Dr. Pitt. Conference call with NREL.
- June 26: Full SSG meeting at DOF's Charlottesville facility. Agenda items to include:
1. Non-Jurisdictional Market: Opportunities & Challenges
 - a. Scott Sklar – federal (including his previous work in valuing solar)
 - b. Cliona Robb – local
 - c. DMME representative – state
 2. Implications of draft “111(d)” federal greenhouse gas regulations
 3. Progress Report from Dr. Pitt and steering committee
 - Group discussion/critique of steering committee findings and suggestions

Early July: Steering Committee work session(s) to modify methodology in view of input from full SSG and prepare elements of draft report. Dates/times TBD. Led by Dr. Pitt.

July 22: Full SSG meeting at DOF's Charlottesville facility, led by Dr. Pitt, to review and discuss elements of draft report prepared by steering committee.

(Possible agenda item on relevant State Corporation Commission issues)

(Additional possibility for July 22 or later: Presentations by utilities regarding their solar activities in Virginia and in other states, and their corporate structures/opportunities/challenges regarding further distributed solar development in Virginia.)

August 18: Deadline for steering committee to complete first draft of report for full SSG, DMME & DEQ.

August 21: Full SSG meeting at DOF's Charlottesville facility, led by Dr. Pitt, to review and comment on steering committee's draft report.

August 31: Deadline for steering committee to complete revised draft of report per full SSG feedback.

Sept. 1-30: NREL review of draft report and technical assistance on final report.

Sept. 1-30: DMME & DEQ review of draft report and feedback to steering committee.

Sept. (TBD): Full SSG meeting, led by Dr. Pitt, to discuss NREL feedback on draft report.

Sept. – Oct: Steering committee work sessions to revise report based on NREL, DMME, & DEQ input.

Oct. (TBD): Full SSG meeting, led by Dr. Pitt, to discuss final draft report.

Oct. 27: Target date for steering committee to send completed report, executive summary, and cover letter (with relevant studies and other materials attached) to DMME & DEQ.

Nov. 1: Due date for report to be submitted by DMME and DEQ to Senator Edwards and Senate Clerk's Office

FOIA

The full SSG and its steering committee will be treated as public bodies, pursuant to advice from agency staff. Therefore, Freedom of Information Act (FOIA) requirements will be observed. However, as the study will not recommend regulatory changes, it will not have to follow the formality of the Administrative Process Act. Please see FOIA information below, provided by Cindy Berndt of DEQ.

FREEDOM OF INFORMATION ACT (FOIA)

POLICY OF FOIA

By enacting this chapter, the General Assembly ensures the people of the Commonwealth ready access to records in the custody of public officials and free entry to meetings of public bodies wherein the business of the people is being conducted. The affairs of government are not intended to be conducted in an atmosphere of secrecy since at all times the public is to be the beneficiary of any action taken at any level of government.

Unless a public body or public official specifically elects to exercise an exemption provided by this chapter or any other statute, every meeting shall be open to the public and all public records shall be available for inspection and copying upon request. All public records and meetings shall be presumed open, unless an exemption is properly invoked.

Meetings

A meeting is:

Any gathering, including work sessions, of the constituent membership, sitting (or through telephonic or video equipment pursuant to § 2.2- 3708 or § 2.2-3708.1) as the group, or an informal assemblage of (i) as many as three members of the group or (ii) a quorum, if less than three, of the constituent membership,

Wherever the gathering is held;

Regardless of whether minutes are taken or votes are cast; and

Where the business of the public body is being discussed or transacted.

Note: This requirement also applies to ANY meeting, including work sessions, of any subgroup of the group, regardless how subgroup is designated (i.e. subcommittee, task force, workgroup, etc.).

Meeting Requirements

Notice: Notice must contain the date, time, and location of the meeting.

Notice must be posted (i) in a prominent public location at which notices are regularly posted, (ii) in the office of the clerk of the public body, or in the case of a public body that has no clerk, in the office of the chief administrator, and (iii) on the agency websites and on the Commonwealth Calendar website.

Notice must be posted at least three working days prior to the meeting.

Recording a meeting: Any person may photograph, film, record, or otherwise reproduce any portion of a meeting required to be open.

Minutes: Minutes are required for any meeting of the group or subgroup of the group. Minutes must include: the date, time, and location of the meeting; the members of the public body present and absent; a summary of matters discussed; and a record of any votes taken. In addition, motions to enter into a closed meeting and certification after a closed meeting must be recorded in the minutes.

Draft minutes of meetings must be posted as soon as possible but no later than 10 working days after the conclusion of the meeting. Final approved meeting minutes must be posted within three working days of final approval of the minutes.

Voting: NO secret or written ballots are ever allowed.

Polling: You MAY contact individual members separately (one-on-one) to ascertain their positions by phone, letter or email. REMEMBER: This exemption CANNOT be used in lieu of a meeting. REMEMBER ALSO: If you choose to use email to poll, you are creating a public record!

Closed Meetings are allowed only as specifically authorized by FOIA or other law and requires a motion stating the purpose, the subject *and* Code cite. [See § 2.2-3711 of FOIA for allowable purposes for closed meetings.] [Note, informational only - closed meetings not allowed for this stakeholder group or any subgroup]

E-Meetings are allowed for state public bodies under heightened procedural and reporting requirements. For all public bodies, limited individual participation by electronic means is allowed under certain circumstances (emergency or personal matter, medical reason, or distance in the case of regional public bodies). [See §§ 2.2-3708 and 2.2-3708.1 of FOIA.]

The rules for an electronic communication meeting or “calling in” are:

1. a quorum of the body must be physically assembled at one primary or central meeting location
2. notice of the meeting has to be given at least 3 working days in advance of the meeting and the notice has to include: the date, time, place and purpose of the meeting, identify **all** locations for the meeting, and include a telephone number that may be used at remote locations to notify the primary or central location of any interruption in the broadcast to the remote locations. (note, interruption of the broadcast shall result in the suspension of action at the meeting until repairs are made and public access restored.
3. the remote locations from with additional members of the public body participate are open to the public and all persons attending at any meeting location have the same opportunity to address the public body as persons at the primary or central location
4. at least one meeting during the year cannot use electronic communication means.

5. all materials to be distributed to members of the public body that are available to staff in sufficient time for duplication and forwarding to all locations shall be made available to the public at the time of the meeting.

6. minutes of all meetings held shall be recorded as for any other meeting and any votes taken shall be recorded by roll-call fashion and included in the minutes.

In addition, a report of the electronic communication meeting has to be made to the FOIA Council and Joint Commission on Technology and Science by December 15. DMME and DEQ will do the reporting, but we will need the following information about the meeting for the report: a copy of the agenda; the number of sites; the number of participants, including members of the public, at each meeting location; a summary of any public comment received about the electronic communication meeting; and a written summary of the public body's experience using electronic communication meetings.

Since the public body is advisory there is an option available to the steering committee through June 30, 2014 (after June 30, the option no longer exists under FOIA). The option allows for the committee to meet by electronic communication means without a quorum of the body being physically assembled at one location, provided the meeting is conducted through audio **AND** visual means at all locations. If you need to know more about this you can contact me or look at FOIA Section 2.2-3708.

E-MAIL AND MEETINGS: The VA Supreme Court has held that e-mails may constitute a "meeting" under FOIA if there is simultaneous e-mail communication between three or more board members. Avoid "reply to all" as a general rule. Also, keep in mind the following tips:

1. Remember the underlying principle of the open meeting provisions of FOIA: the public has the right to witness the operations of government. If you question whether your email communication might lead to the deliberation of public business by three or more members of a public body in real time (i.e., has an element of simultaneity), then you may be better served by saving that communication for a public meeting.
2. If you receive an email sent to three or more recipients who are members of the same public body, and you wish to respond, choose "respond to sender" instead of "respond to all." One-on-one communications are clearly allowed under FOIA, and this will avoid an email discussion among three or more members.
3. When composing an email to send to three or more members of a public body, enter the recipients' addresses in the "blind carbon copy" (bcc) field instead of in the "to" field. By doing this, an individual recipient will not be able to automatically respond to anyone but you.
4. Use staff to send emails on behalf of members to ensure the exchange of emails will not be a simultaneous communication among three or more members which could constitute a meeting.

RECORDS

A "public record" is any writing or recording, in any format, prepared or owned by, or in the possession of a public body or its officers, employees or agents in the transaction of public business. For example, public records may be in the form of handwritten notes, typewritten documents, electronic files, audio or video recordings, photographs, or any other written or recorded media.

The definition of “public record” does not distinguish between draft or preliminary versions and final versions, so both are considered public records under FOIA.

Emails that relate to the public business are public records, regardless of whether you use your home or office computer, text or other forms of social media. It is the **content** of the record, not the equipment used, that controls.

ALL public records are OPEN to the public UNLESS a specific exemption in law allows the record to be withheld.