

La Capra Associates

Task 2: Evaluation of Senate Bill 3 REPS

Prepared by: *La Capra Associates, Inc.*

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NC EPC Study – Where We Are

- **Task 1: Scope has been defined and widely circulated**
- **Task 2: Review of Senate Bill 3 REPS to discuss today**
- **Task 3: Initial cut at resource potential and costs**
- **Task 4 A: Develop Scenarios and Model Resource Portfolios**
- **Task 4B: Economic Impact Study (TBD)**
- **Task 5: Final Written Report for April**



Senate Bill 3 REPS – What we want to Address

- **Context:** What is Senate Bill 3 REPS and how does it compare to La Capra 2006 Study Assumptions?
- **Compliance:** How is implementation lining up with its stated objectives and targets?
- **Carbon Strategy:** How does Senate Bill 3 REPS address GHG emissions and what low GHG emitting resources are missing?
- **Economic Development Impacts:** How does Senate Bill 3 REPS address enhancing North Carolina economy and job creation?
- **Key Issues:** What key stakeholder issues have emerged?



Context: Summary of Senate Bill 3 REPS



Summary of Senate Bill 3 REPS: Stated Objectives & Resource Options

Key Objectives

- Maintain reliability while diversifying resources
- Improve air quality
- Enhance energy security through indigenous resources
- Promote private investment in renewables and efficiency

Resource Options

- Energy Efficiency
- Renewables
- Combined Heat & Power



Summary of Senate Bill 3 REPS

- **Signed into law August 2007**
- **Requires IOUs to meet 12.5% of 2020 demand with a mix of renewable energy and energy efficiency by 2020**
 - **Up to 40% of requirements can be met by energy efficiency**
- **Requires municipal and cooperative providers to meet 10% of 2017 demand with a mix of renewable energy by 2018**
 - **Once set-asides are met, all requirements can be met by energy efficiency and demand side management**



Summary of Senate Bill 3 REPS (continued)

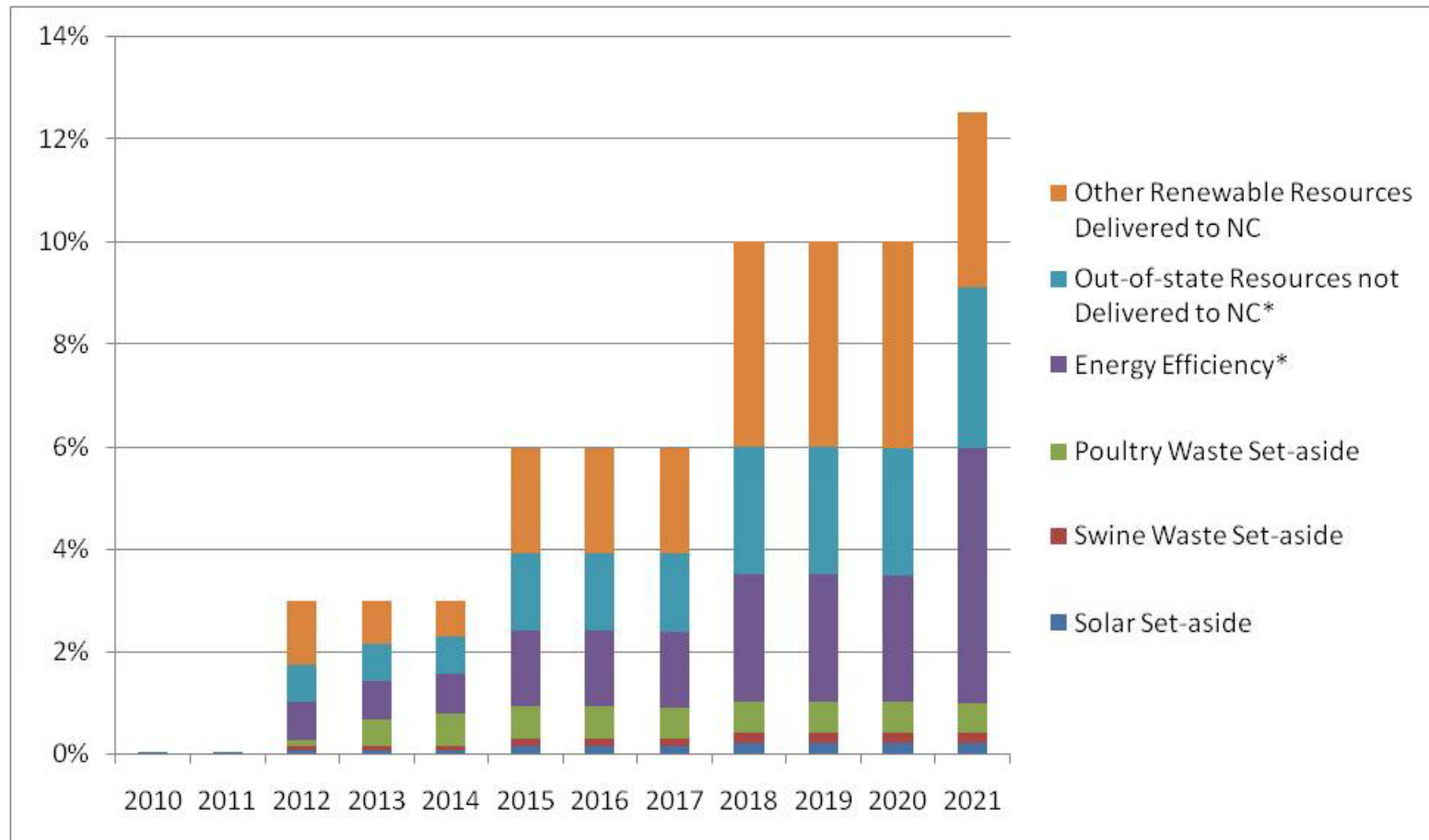
- **Both IOUs and Munis/Coops must meet the following set-aside requirements:**
 - **Solar: 0.2% of retail sales by 2018**
 - **Swine Waste: 0.2% of retail sales by 2018**
 - **Poultry Waste: 900,000 MWh by 2014**
- **Cost for the program is capped at the following levels annually*:**

Sector	2008	2012	2015
Residential	\$10	\$12	\$15
Commercial	\$50	\$150	\$150
Industrial	\$500	\$1000	\$1000

*Cost per customer, per year



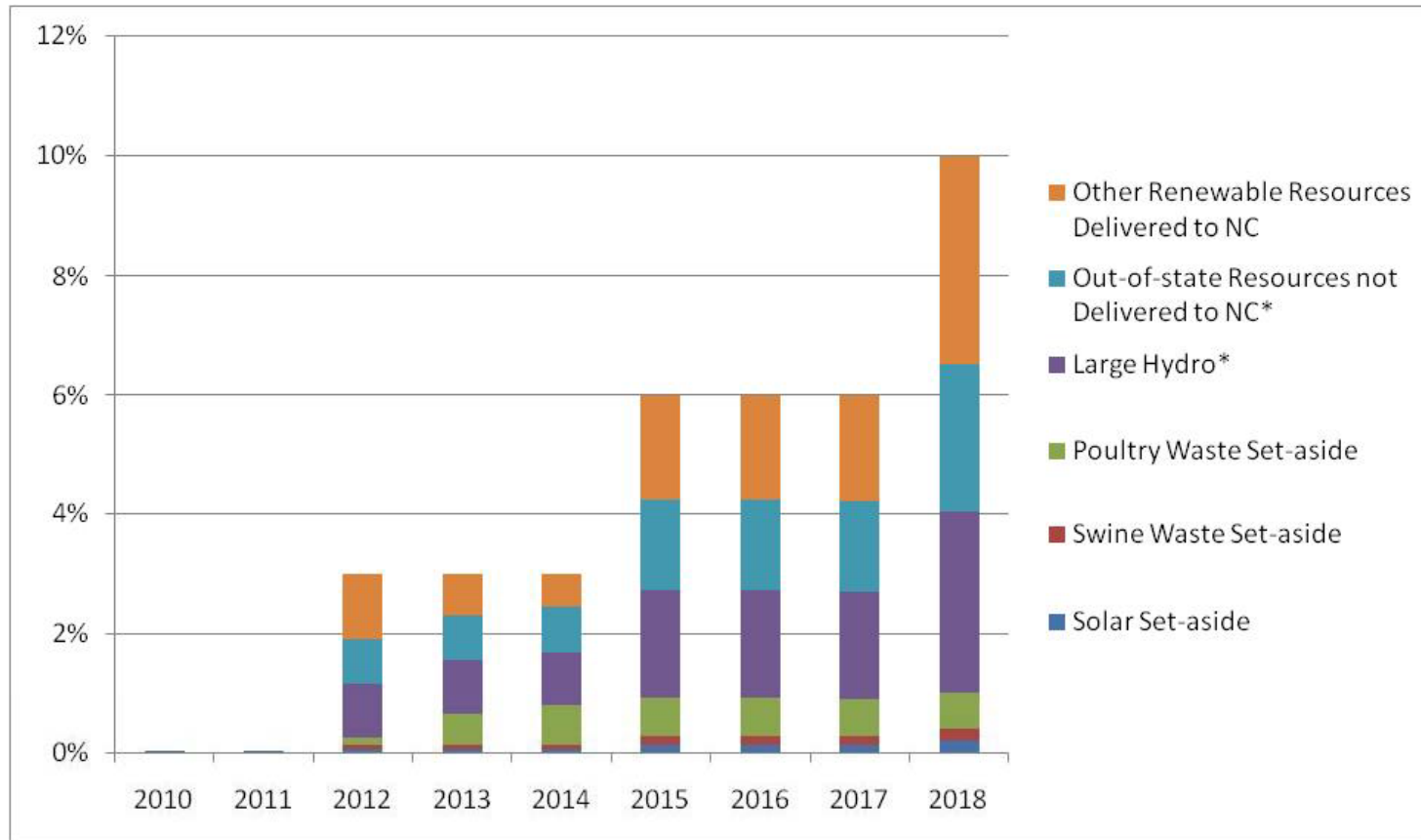
Senate Bill 3 REPS Targets, IOUs



*Represents maximum portion of requirement which can be satisfied by:

- Energy efficiency (25% through 2020, 40% thereafter)
- Out-of-state resources (25%)

Senate Bill 3 REPS Targets, EMCs and Municipal Utilities



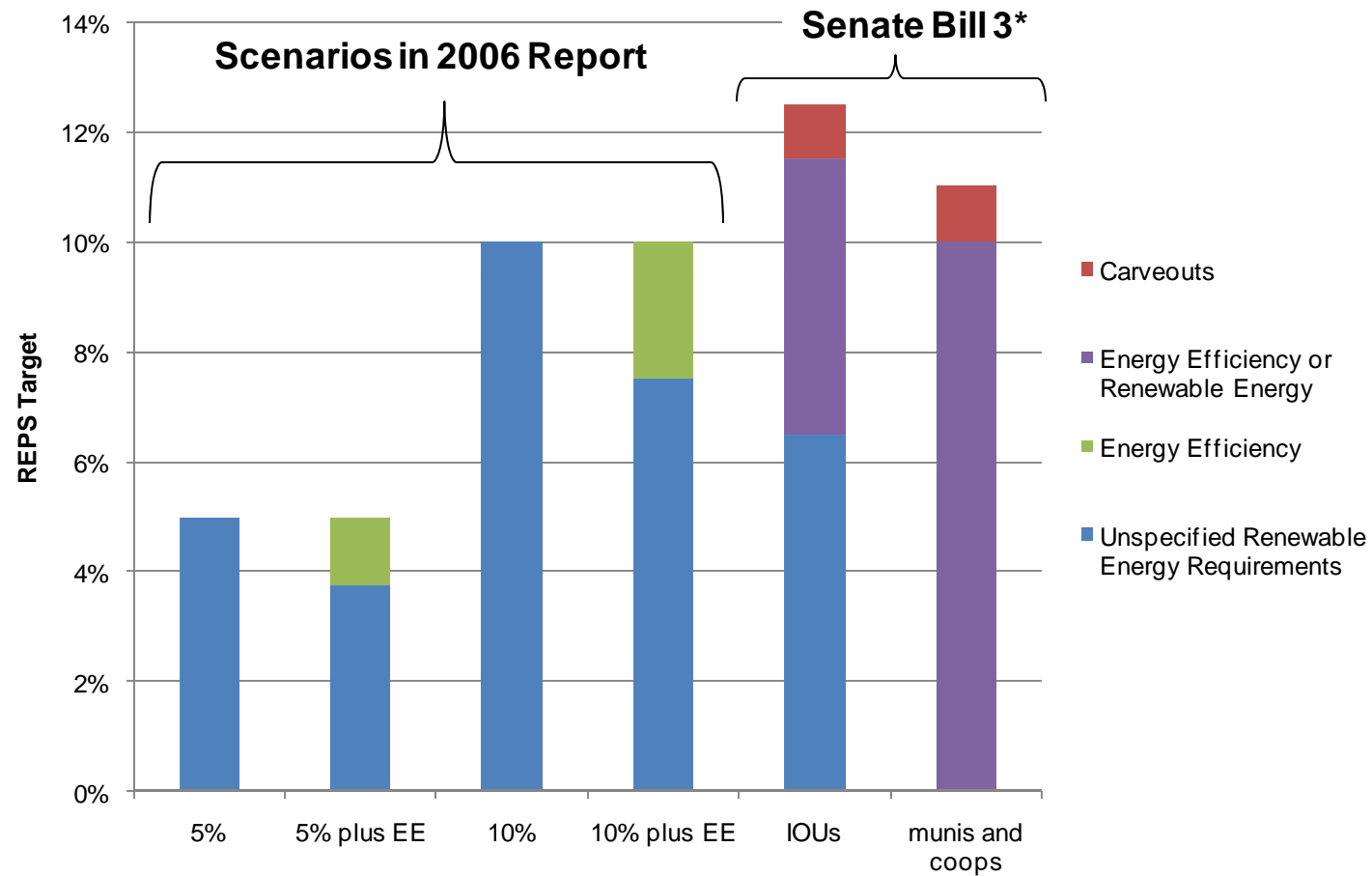
*Represents maximum portion of requirement which can be satisfied by large hydro (30%) and out-of-state resources (25%)

Note: EMCs and municipals may satisfy all of the requirements beyond the set-asides with energy efficiency and demand side management and may use resources online before 2007.

**Context: Comparison of Senate Bill 3 REPS to Policies
Evaluated in 2006 La Capra Associates Report**

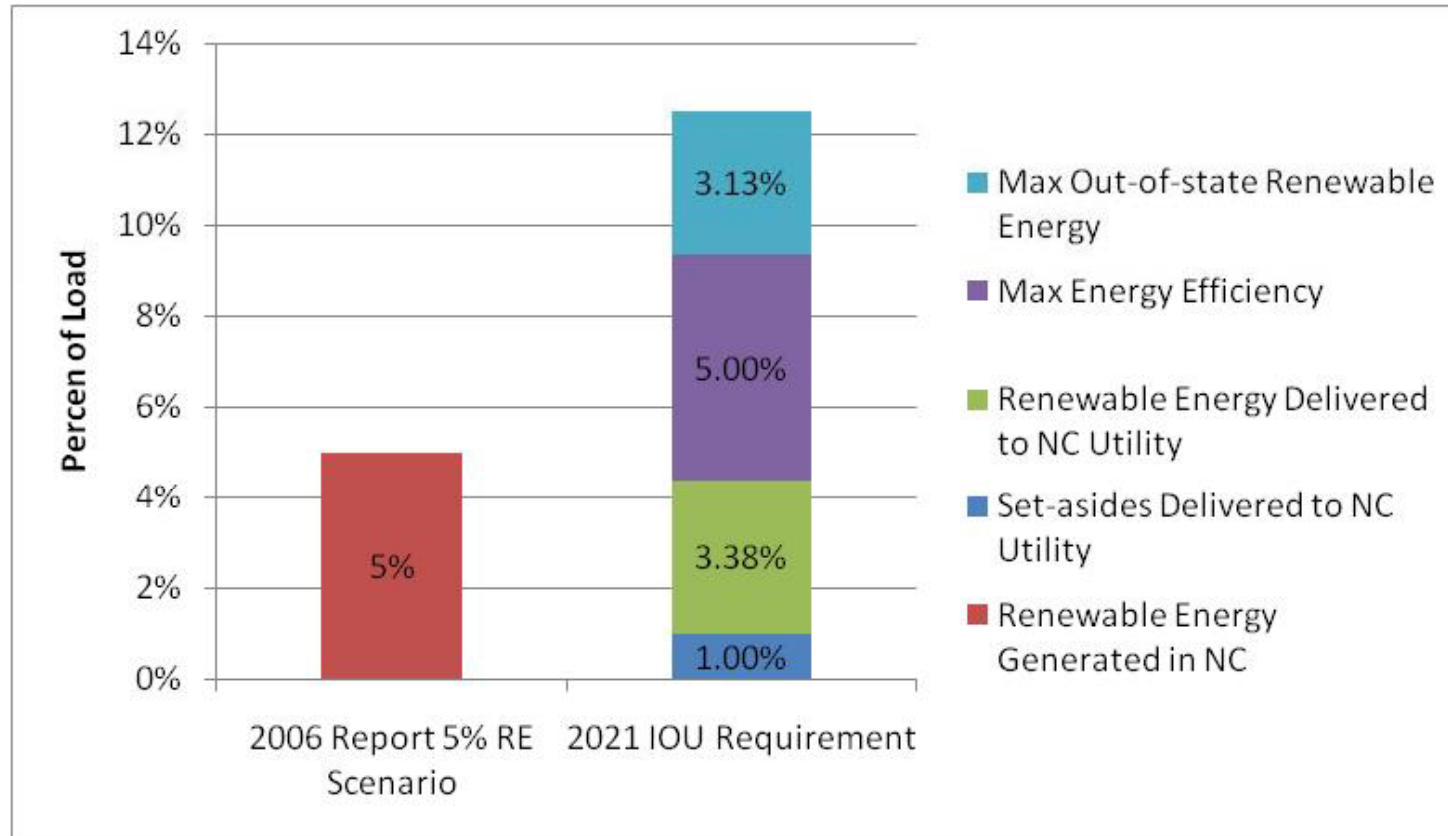


Comparison of 2006 Report vs. Senate Bill 3 REPS: Targets



*Assumes target year of 2021

North Carolina utilities can comply with the 12.5% without including any of potential identified in our 2006 Study*



*The 2011 La Capra Study will provide updated potential estimates for various resource options.



Comparison of 2006 Report vs. Senate Bill 3 REPS

Key Difference: Location of Renewable Resources

- **REPS has no in-state (within North Carolina) requirements.**
 - **25% of requirement can be met by out-of-state renewable resources not delivered to North Carolina.**
 - **The rest must be met by bundled energy delivered to the utilities service territory.**
- **The 2006 La Capra Associates' analysis assumed all of the renewable energy must be generated in North Carolina.**
 - **2006 La Capra Study did not therefore assess a national market for RECs or renewable potential in neighboring states.**



Comparison of 2006 Report vs. Senate Bill 3 REPS

Conclusion: Expectation of Sufficient Resources

- 2006 Report assumed all in state renewable resources
- 2006 Report concluded North Carolina should have enough in-state renewable resources to meet the 5% scenario without energy efficiency.
- However Senate Bill 3 REPS provides a number of ways to comply which minimizes the amount of in state renewable resources necessary to satisfy the REPS.
- Senate Bill 3 REPS assumes a much larger renewable resource pool and enables energy efficiency to qualify for REPS.



Set-asides Senate Bill 3 REPS vs. 2006 Report

- **2006 Report did not include set-asides**
- **2006 Report did look at practical potential of swine and poultry waste**
 - **Assumed that Solar would be too expensive**

Set-aside*	2006 Report	SB 3
Solar	Excluded based on Cost	0.2% by 2018
Swine Waste	NC Practical Potential = 600 GWh	0.2% by 2018 (~300 GWh)
Poultry Waste	NC Practical Potential = 800 GWh	900 GWh by 2014

*Set Asides qualify so long as they are delivered to North Carolina. Solar set aside can be met by out of state RECs as part of 25% provision.

Included Resources in Senate Bill 3 REPS vs. 2006 Report

- **Senate Bill 3 includes similar resources to the NC GreenPower definition used by La Capra in the 2006 report with the following exceptions:**
 - **Munis/Coops may satisfy 30% of their requirements with large hydropower.**
 - **IOUs may satisfy up to 40% of their requirements with energy efficiency after 2020 and Munis/Coops may satisfy all of their requirements with energy efficiency or DSM.**
 - **Commission recently ruled that whole tree biomass is included as a renewable fuel. NC GreenPower definition only included waste wood.**



Energy Efficiency in Senate Bill 3 REPS vs. 2006 Report

Energy Efficiency (2006 Study)

- Considered only energy efficiency (not load management or other DSM)
- Only considered in-state resources.
- Suggested 25% of RPS be met with EE resources

Energy Efficiency (SB 3)

- IOUs are limited to 25% of total requirements for EE; IOUs may not apply DSM
- EMCs/Municipals may fulfill all requirements beyond set-asides with EE or load management
- Unclear whether EE/DSM resources can come from out-of-state
- No minimum EE requirement



Evaluation of Compliance to Date: Objectives



Implementation: How are Stated Objectives of Senate Bill 3 REPS Lining up?

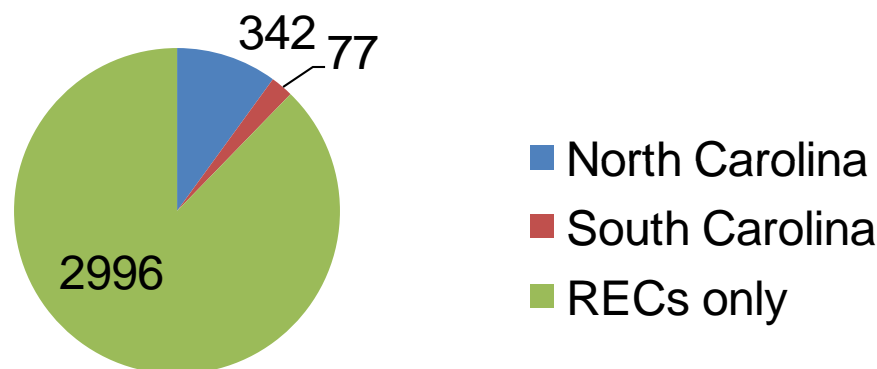
<u>Stated Goals</u>	<u>Performance to date</u>
Diversify resources	Some diversification on regional basis expected
Energy security through use of indigenous resources	Some especially through biomass but no requirement to be in state.
Promote private investment in renewables and efficiency	Some of this is happening on regional basis but tax and job benefits will not be in NC if resources not required to be in state
Improve air quality	Pro: Biomass displaces fossil fuel burn Con: NOx emissions from biomass and concern re poultry waste



New Renewable Energy Facilities Registered with NCUC

- **NCUC requires registration of any facility being used to fulfill REPS**
- **176 New Renewable Energy Facilities registered with the North Carolina Utilities Commission as of December 1, 2010***
 - **119 Facilities in North Carolina**
 - **12 Facilities in South Carolina**
 - **45 Facilities RECS only – won't deliver energy to state (CA, IA, KS, TX, IL)**

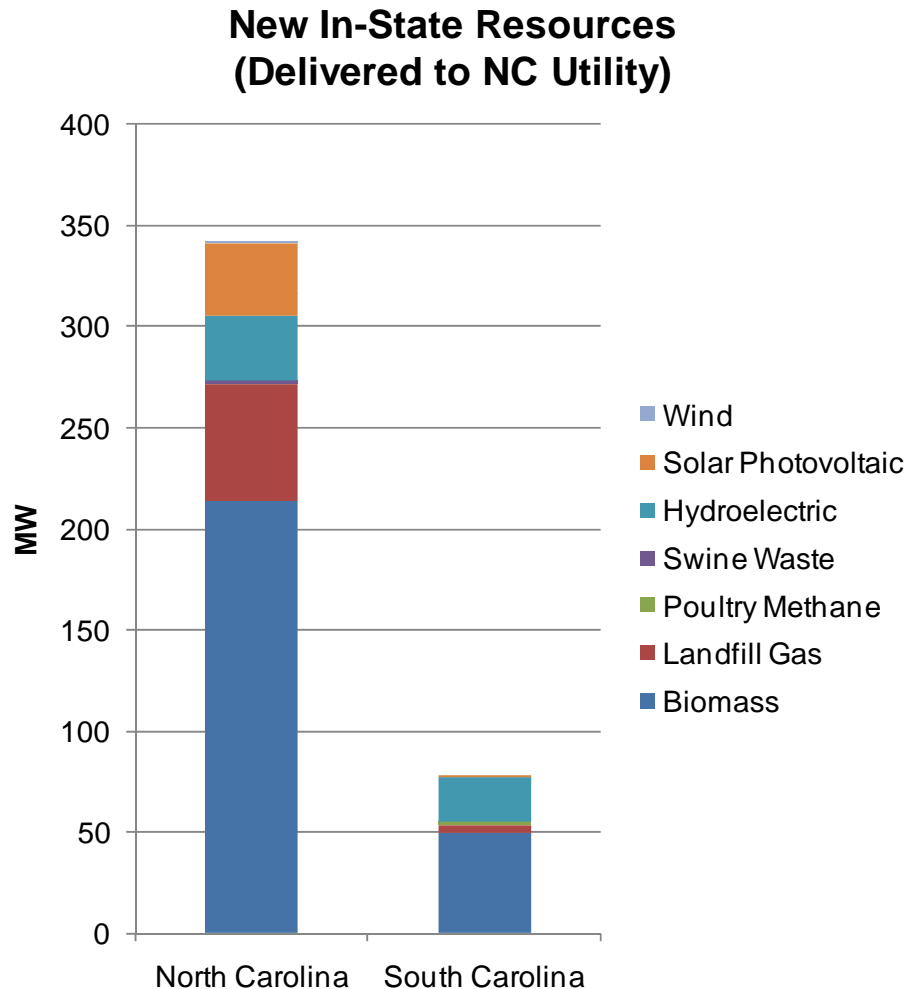
Location of New Facilities by Capacity (MW)



Source: North Carolina Utilities Commission Web Site, <http://www.ncuc.commerce.state.nc.us/reps/reps.htm>

*Not all registered facilities are online or contracted for yet and their RECs may not end up in North Carolina

Registered in state resources

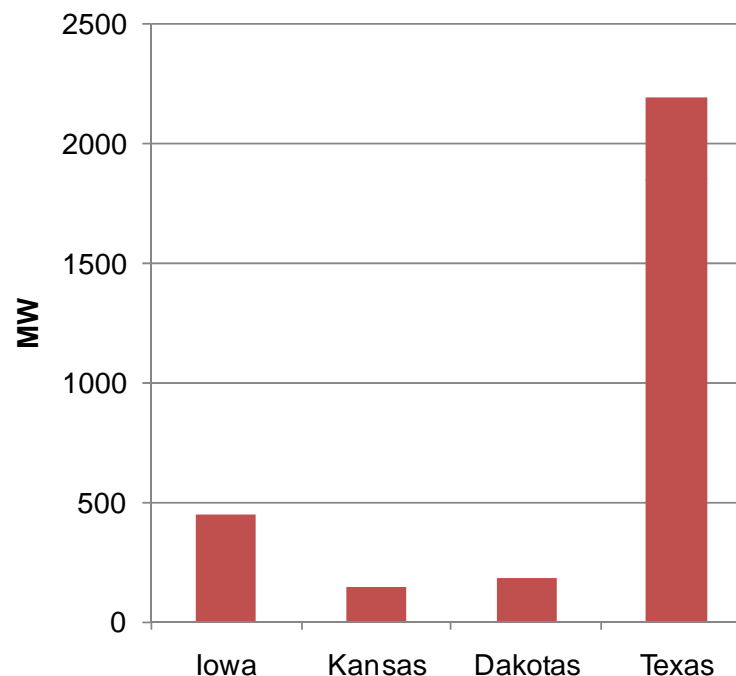


- **La Capra 2006 report anticipated biomass as the most abundant and economic NC resource**
- **Majority of resources registered with NCUC are biomass**
- **Note that SB3 includes all hydro <10 MW, resources previously contracted with NC GreenPower in addition to those online after 1/1/2007 as New**
- **Of the registered biomass facilities, only 3 MW in NC and 50 MW in SC represent Greenfield development**

Registered Facilities Providing RECs Only

- **The majority of facilities registered are located out-of-state and can not deliver to NC**
- **These facilities can be used to satisfy for 25% of the REPS requirements.**
- **RECs are lowest cost option to fulfill REPS and likely to be fully utilized in compliance**
- **The vast majority of out-of-state facilities registered are wind resources**
- **Some solar resources are also registered:**
 - 10 MW in Illinois
 - 12 MW in California

Out-of-State Wind Resources



Energy Targets/Allowances for Resource Types

Entity ¹	2011 Sales forecast (MWh) ²	Overall requirement 3%	2012 Set-Aside Targets (MWh)			2012 <u>Maximum</u> Allowances (MWh)	
			Solar	Swine	Poultry ³	Energy Efficiency	Out-of-state RECs
Duke	54,510,205	1,635,306	38,157	38,157	72,868	408,827	408,827
Progress	36,878,000	1,106,340	25,815	25,815	48,683	276,585	276,585
Dominion	4,095,400	122,862	2,867	2,867	5,505	30,716	30,716
GreenCo	13,098,855	392,966	9,169	9,169	15,513	No maximum	98,241
NCEMPA	6,913,548	207,406	4,839	4,839	9,138	No maximum	51,852
NCMPA1	4,963,795	148,914	3,475	3,475	6,322	No maximum	37,228

¹ The 6 entities listed represent the majority of retail sales (93% in 2008)

² Data source: 2010 REPS Compliance Plans

³ Values based on 2008 portion of total NC sales

Existing Renewable Energy Facilities Registered with the Commission

Technology Type	Number of Facilities	Total MW
Biomass - CHP	1	60
Landfill Gas	1	4.9
Hydroelectric	7	33

- **Munis/Coops may use RECs from renewable energy facilities online before 2007 to comply with the REPS**
- **There are 9 facilities registered with the NC Commission**
- **All facilities are located in North Carolina**

D18 table is hard to read

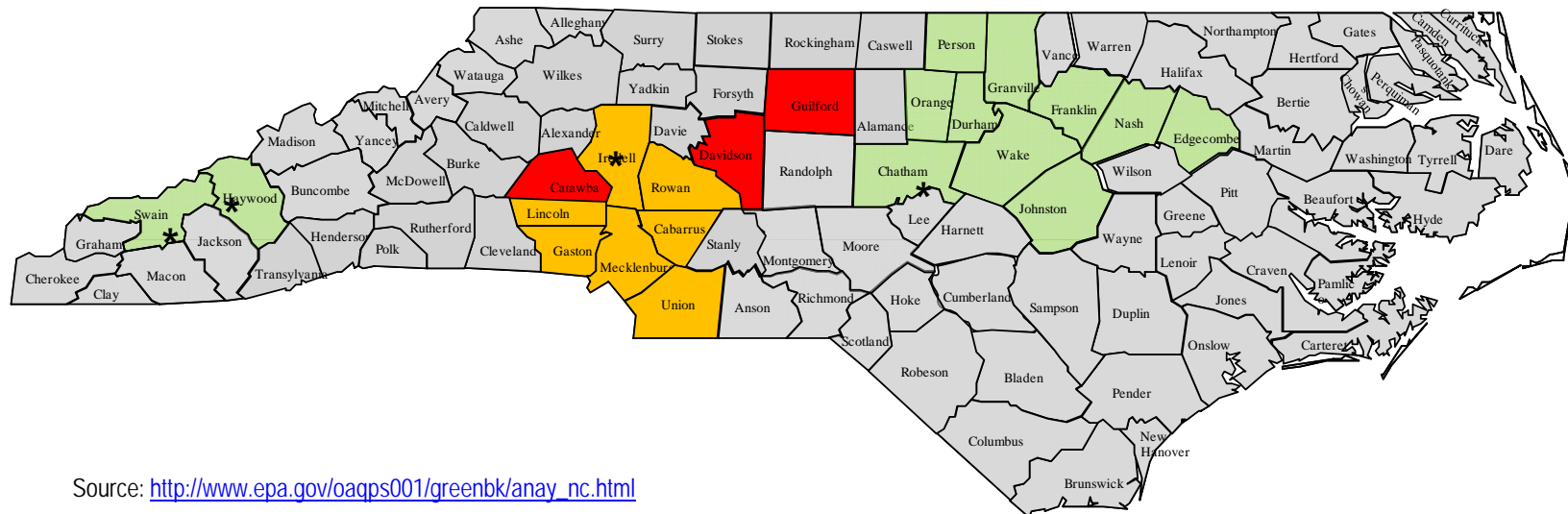
how does these resources compare to the overall targets that the munis/coops need to hit?

Danp, 12/20/2010

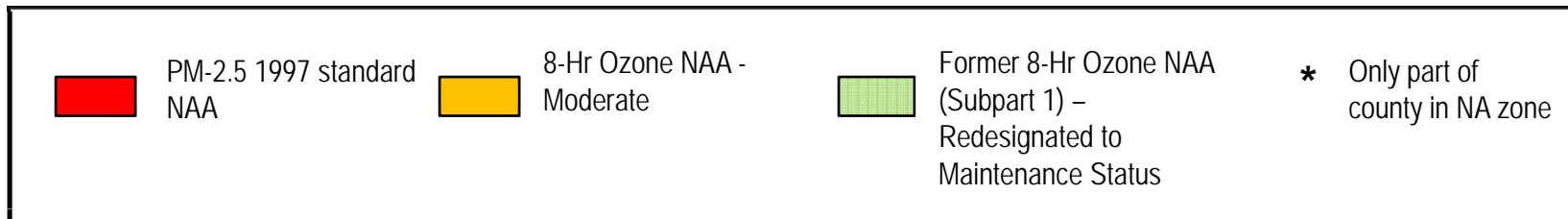
North Carolina Air Quality and REPS

- **North Carolina has made significant progress even before REPS**
 - 12 counties have achieved maintenance status for NAAQS since 2006
 - Duke and Progress have already achieved most of the 2013 targets of Clean Smokestacks Act
- **Still much work to go**
 - 10 counties still in nonattainment status for particulate matter or ozone
 - Federal emissions standards expected to get tougher and broader.
- **REPS role in air quality**
 - Many renewable resources are nearly emissions free but biomass with large potential is not
 - Biomass combustion does have significant NOx and other emissions
 - Emissions-free renewables in upwind states can have positive impact on air quality in North Carolina
 - Possible arsenic pollution from combustion of poultry litter is a concern

Nonattainment Areas (NAAs) Since 1995 for All Criteria Pollutants (2010)



Source: http://www.epa.gov/oaqps001/greenbk/anay_nc.html



Evaluation of Compliance to Date: Targets



Resources Procured/Planned –Coops

- **Complying largely through allowances from Southeast Power Administration (SEPA) and energy efficiency**
- **Also looking at in and out of state RECs**
- **Have met solar set aside through 2011**
- **Under the cost cap in 2009**



Resources Procured/Planned – Munis

NCEMPA

- **Prohibited from purchasing or generating renewable energy until 2018 given power supply contract with Progress**
- **Expect to meet Senate Bill 3 REPS compliance through supplemental purchases from Progress and energy efficiency**
- **Expect to be at cost cap levels through 2012**

NCMPA1

- **Focused on energy efficiency as well as renewable development for compliance**
- **Meet solar set aside through looking at solar facilities within member service territories**
- **Working with other electric power suppliers to meet swine and poultry set asides**



Resources Procured/Planned – Utilities

- **Utilities on track to compliance in 2012**
- **Utilities met 2010 Solar set aside and on track for 2012 compliance**
- **Banking of RECs for future compliance**
- **Largest challenge has been with poultry and swine set asides but negotiations underway**
- **Lowest cost options are out of state RECs**
- **Variety of resources fulfilling general requirements**
 - **Wind**
 - **Hydro**
 - **Biomass**
 - **Energy Efficiency**



Location of Resources (to date)

- **Much of Swine and poultry waste facilities likely to be in North Carolina**
- **Some in state solar has been pursued**
- **Utilities anticipate pursuing low-cost out-of-state RECs**
- **Wind resources to date have been out of state**
- **Remaining resources (landfill gas and biomass) have largely been in state to date**



EE/DSM – Implementation for 2012 Compliance

- The IOUs and Municipal Power Agencies plan to use considerable EE resources as low-cost compliance
- Values in the table below include use of banked EE credits from 2008-2011, so similar levels may not continue in 2013.
- The entities listed below represent the majority of electricity sales in NC

Power supplier	% of Compliance (2012)
Duke	25%
Progress	25%
Dominion	17%
NCEMPA	49%*
NCMPA1	20%*
Sales-weighted average	26%**

* Includes EE and DSM. EMCs and Municipal Utilities are permitted to use DSM measures for REPS compliance, but IOUs are not.

** Sales-weighted average aggregates sales and EE credits used for the 5 entities

2011 Approved REPS Riders Below Cost Caps*



■ Progress (December 1, 2010 - November 30, 2011) ■ Duke (September 1, 2010 - August 31, 2011)

■ Cost Cap 2011

*Dominion has not yet filed for a REPS rider



Carbon Strategy



Low Carbon mitigation resources not addressed in SB 3 REPS

- **Natural gas was not discussed**
 - **Gas fuel switching has the potential to provide cost effective carbon mitigation**
 - **Natural gas used for power generation compared to coal generation, offers significantly reduced emissions of carbon**
- **Nuclear power was not included**



Key Issues related to Senate Bill 3



Issues with Senate Bill 3 – Overview

- **Key Issue Areas include:**
 - **Definition of “in-state” vs. “out-of-state” resources**
 - **Set-aside requirements**
 - **Resource concerns**
 - **Energy efficiency**
 - **Implementation and operational issues**



Issues with Senate Bill 3 REPS – In-state vs. Out-of-state

- **Current structure allowing some out-of-state resources to qualify as in-state may result in the 12.5% requirement being fulfilled with very small percentage of new renewables in NC**
- **Classification of out-of-state resources as in-state may be limiting renewable development in NC, but also allows utilities to minimize cost of compliance**
- **NCUC has addressed several issues regarding the 25% limitation on out-of-state resources**
 - **25% limitation applies to REPS general requirement, as well as each set-aside individually**
 - **RECs from out-of-state energy delivered to NC border count as in-state resources, but thermal RECs from same facilities are out-of-state**
- **No consideration of potential deliverability of out-of-state RECs to NC border – linking to grid development**



Issues with Senate Bill 3 REPS – Set-aside Requirements

- **Should set-aside requirements take priority over the general REPS requirement as NCUC determined?**

- **Poultry and Swine waste set asides**
 - **Poultry set aside is costly has faced some technological challenges**
 - **Poultry target ramp up from 2012 to 2014 is significant**
 - **Potential market power concerns**
 - **Concern this could eat up much of the cost cap**
 - **Cost recovery for unbundled energy from poultry and swine waste under review**



Issues with Senate Bill 3 REPS – Set-aside Requirements (continued)

■ Solar set-aside

- **Current schedule of stepped increases in requirements may result in a boom-bust cycle of development**
- **Will level of set-aside requirement sustain growth in the North Carolina solar industry?**
 - Some utilities will be able to bank enough RECs to fulfill REPS requirement for years to come
 - Potential for larger solar set aside level to lower prices and more lead to greater solar development by providing more economies of scale
- **Does set aside promote NC economic development?**
 - Solar RECs readily available out of state
- **Solar thermal RECs which are readily available in NC must be metered.**
 - NCUC is currently developing methods for accounting for unmetered solar thermal RECs



Issues with Senate Bill 3 REPS – Resource Concerns

■ Biomass

- Uncertainty regarding definition of biomass and what is included – NCUC issued ruling in September allowing chipped whole trees to qualify
- No consideration of sustainability of biomass harvest
- No delineation of resources based on sustainability

■ Wind

- Wind is defined as a renewable resource in S.B. 3, but bill contains no further discussion
- Ridge Law effectively prohibits wind power development in much of the high potential areas in western NC
- Wind is typically an economical method of compliance in other states, but NC has experienced little development activity to date

Issues with Senate Bill 3 REPS – Energy Efficiency

- **Consideration of whether inclusion of EE in the REPS bill is the optimal method for achieving legislation’s goal of increasing investment in EE**
- **Inclusion of EE as a part of REPS has created some confusion in interpretation**
- **Some suppliers anticipate EE savings in excess of the 25% maximum, prompting consideration of more aggressive efficiency targets**
- **S.B. 3 contains limited guidance on the measurement of energy saved through EE and demand-side management (DSM) measures**
- **Uncertainty exists regarding the use of demand response measures in compliance**



Issues with Senate Bill 3 REPS – Operational Concerns

- **Several concerns have been raised regarding REPS implementation**
 - Many of these issues are the subject of filings with the NC Utilities Commission. (See Appendix for Summary)
- **Compliance**
 - Commission will "Provide for the monitoring of compliance with and enforcement of the requirements"
 - Utilities Commission's final decision is that no specific penalties would be defined
- **Transparency of REC transactions**



Next Steps

- **Incorporate additional feedback**
- **Develop Scenarios and strategies**
- **Conduct Analysis and evaluate impacts**
- **On-going coordination with Oversight Committee and EPC**



Task 3: Evaluation of resource potential

Resource Options – What we want to Address

- **Context: What is Task 3?**
- **Summary: How do resource options compare on a levelized cost basis?**
- **Renewable Resource Options: What is the technical and practical potential of key renewable resources?**
- **Energy Efficiency: How do we think about potential?**
- **Baseload Generation: What is the practical potential for natural gas Cts/CCGts and nuclear plants?**



Context – Task 3

Task 3: Develop potential and cost estimates for various resource options, including energy efficiency

- **There is a wide divergence of stakeholder views on resource potential and costs**
- **There is new information since La Capra completed its 2006 study**
- **La Capra did not include gas and nuclear generation in its 2006 study**
- **La Capra also did not look at resources outside of North Carolina**
- **Deliverable is a spreadsheet with key input numbers, including technical and economic potential, capacity factor, O&M costs, cost acceleration assumption and levelized costs**
- **La Capra is in the process of finalizing these estimates**

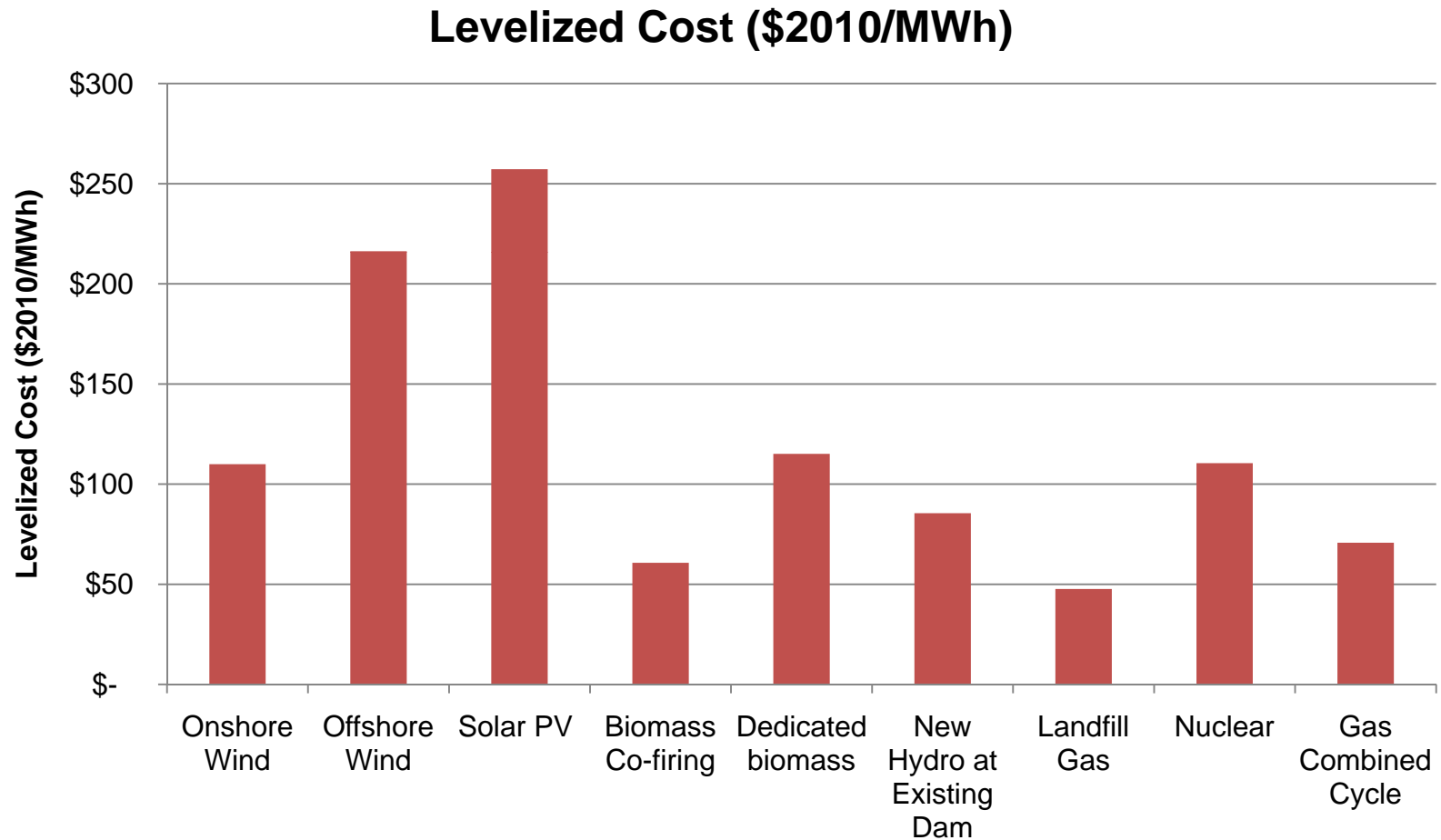


Context: Task 3 – Our Approach

- **Analysis involved review of peer reviewed studies and literature, stakeholder input, confidential utility information, and recent project development data**
- **Analysis took into account NC specific information**
- **Definitions for technical and practical potential may vary by resource**
- **Potential was derived both for NC as well as what is deliverable to NC, as under REPS**



Summary – Comparison of Resource Options on a Levelized Cost Basis



Renewable Resource Options – Forest Biomass

- Recent NCUC ruling indicates biomass energy from whole trees can be eligible for REPS compliance.
- Technical potential estimate of 2,500MW
 - Assumes 85% of residues and all pulpwood harvest annually in North Carolina and northern South Carolina used for biomass energy.
- We are collaborating with Bob Abt (NCSU) and others to use the Southern Regional Timber Supply (SRTS) model to estimate *practical* forest biomass availability.
- Preliminary model runs indicate that at least 10,000 GWh (1,400MW) of biomass energy from forest resources may be feasible by 2021.
- Key assumptions include: low non-RPS biomass demand (RFS, pellets, etc.), high residue utilization rates (70-85%), no sustainable harvesting requirements, draws from North Carolina and northern South Carolina.

Renewable Resource Options – Other Biomass

- LCA 2006 report also considered urban waste, energy crops and crop residues for biomass potential.
- No indication found that the technical potential estimates have changed significantly.
- Estimates revised to reflect inclusion of South Carolina counties within Duke/Progress service territories.
- Practical potential assumes 50% utilization (from Abt et al. 2010):

Resource	Tech. Potential (MW)	Pract. Potential (MW)
Urban wood residues	221	110
Crop residues	315	158
Switchgrass	216	108



Renewable Resource Options – Biomass Co-firing

- **Co-firing potential is a subset of overall biomass potential.**
- **Potential determined from boiler-specific max co-fire rates on coal plants in NC and northern SC.**
 - **Used max co-fire rates from Abt, Galik & Henderson (2010)**
 - **Range from 10-20% of heat input**
 - **Did not include plants scheduled for retirement in Duke and Progress 2010 IRPs**
- **Technical potential is 77 million MMBtu heat input**
 - **Corresponds to ~925 MW (@ 12,000 H.R., 80% CF)**
- **Given high biomass resource potential, no reason to believe fuel constraints will restrict practical potential**
 - **Practical potential = 925 MW; or about 1/2 of practical fuel potential**

Renewable Resource Options – Hydropower

- **Used updated Hydropower Evaluation Software (HES) from Idaho National Engineering and Environmental Laboratory (INEEL)**
 - Same data as 2006 report
- **Evaluated 133 sites in NC and part of SC**
 - Sites with and without existing generation, and undeveloped sites;
 - Hydropower Evaluation Software assigns development likelihood factors (0.1 – 0.9) based on environmental and site attributes.
- **Technical potential = HES-modeled potential = 938 MW**
 - Nameplate capacity * HES likelihood factor
- **Practical potential = 106 MW**
 - Eliminated sites <1 MW (too expensive) and >10 MW (not eligible for IOU REPS compliance)
 - Eliminated sites with HES likelihood factor < 0.5

North Carolina's Renewable Resource Options – Offshore Wind

- North Carolina has significant offshore wind potential
- Development in Pamlico Sound found challenging due to project size
- It looks like future development will be farther offshore
- Coastal Wind for North Carolinas Future presents a comprehensive look at NC Offshore Wind Resources
 - We used this source directly for technical potential
 - Practical potential developed by assuming lowest capacity factor and poor sea floor resources not built
 - Assumed maximum 25% technical potential was feasible
 - Resources in deepest water and farthest from shore considered less feasible

	Technical Potential (MW)	Practical Potential (MW)
State Waters	1,961	289
Federal Waters	37,179	5,647
Total	39,140	5,936

North Carolina's Renewable Resource Options – Onshore Wind

- **Wind Development in the state is severely limited by the ridge law**
 - Stakeholders believe that western wind won't happen without big policy change
 - Western Wind appears to be about ½ of the state's potential
- **Latest NREL numbers show 807 MW of potential with 80m tower**
 - 100m towers would increase potential to 1500 MW
- **About half of the potential is in the West, so current practical potential is about:**
 - 400 MW with 80m towers and
 - 750 MW with 100m towers
- **Developers believe that potential in eastern North Carolina may be as high as 1000-1500 MW, but are still collecting wind data**
- **North Carolina's neighbors have potential for similar amounts of development except Virginia which has much more**

Renewable Resource Options – Solar

- **Solar development in North Carolina and areas with deliverability to North Carolina are not limited by technical factors, but by costs and financing**
- **Solar costs have declined significantly in the past year:**
 - **Module costs now under \$2/Watt**
 - **Total installed costs now under \$4/Watt**
- **Even if costs were reduced by half, solar would still be more expensive than onshore wind**



Energy Efficiency – Definitions of Potential

- **Technical** - Engineering estimates of energy savings if standard stock is replaced with most efficient measures. No consideration of economics, market or regulatory barriers.
- **Economic** – Estimated savings from measures that have passed an economic analysis compared to utility avoided costs.
- **Achievable** – Economic potential that is net of free-riders and is limited by a realistic maximum penetration rate (<100%).
- **Utility Program** – Energy efficiency savings that is estimated that utility programs will reach, e.g. utility programs will not reach the opt out customer base and may not address all measures that produce energy efficiency savings.



Energy Efficiency – Factors in Determining An Achievable Potential Number

- **Methodology:** Bottom up or top down
- **Timeframe:** Number of years to reach potential
- **Perspective:** Limit to utility programs or broader to include other EE development arrangements such as ESCOs, building, lighting and appliance standards and enforcement
- **Current Laws/Regs:** Such as opt-out provisions and where the impact of newly adopted codes and standards are accounted for
- **Use of Potential No.:** As set a target, to establish a minimum, as a utility performance standard
- **Goal:** To beat utility marginal costs or to minimize REPS compliance costs
- **Forecasting:** Accounting for free-riders (but not double counting)



Energy Efficiency – Different Approaches to Developing Potential

Utility Sponsored – 4%

- **Bottom-up approach**
 - **Looks at program economic potentials**
 - Adjusts for opt-out eligible customers exercising their right
 - Adjusts for maximum potential
 - Adjust effects for free-riders
 - **Focus on M&V for cost recovery and incentives**

ACEEE Meta Study– 24%

- **Top down approach**
 - **Technical Potential**
 - **Economic Potential**
 - **Includes**
 - State and Federal code changes
 - Education and training programs
 - CHP
 - Public facility performance contracting



Energy Efficiency – Developing a Potential

- **Considerations from stakeholder discussions**

1. Maximize EE role in minimizing REPS compliance costs
2. Function as a realistic benchmark threshold for the IRP process
3. Expand the capture of energy efficiency potential from large customers
4. Recognize the realities of rules and regulations for utility programs

- **La Capra Approach**

1. Utilize ACEEE meta analysis information to determine 15 year potential
2. Adjust for Free Ridership and realistic long term penetration rates
3. Adjust for opt-out estimates



Baseload generation – Gas

Year	Technical Potential (MW)	Practical Potential (MW)
2015	N/A	5,218
2021	N/A	13,893

- **Technical potential:** Due to sufficient fuel supply resources, technical potential is not significantly limited.
- **Practical potential:** Limited by load growth. Potential represents planned new generation in utility IRPs fulfilled only with new gas generation.
- **Plant costs and characteristics:** Based on recent NC-specific estimates from EIA’s AEO 2011. Values are consistent with industry sources and peer reviewed studies.



Baseload generation – Nuclear

- **Potential for new nuclear generation is limited by political, regulatory and financial factors.**
 - **New construction unlikely before 2015**
 - **One or two nuclear facilities could be developed by 2021**

- **Plant costs and characteristics: Based on recent NC-specific estimates from EIA's AEO 2011. Values are consistent with industry sources and peer reviewed studies.**

- **Small modular nuclear reactors are in prototype phase and have potential to alter cost, financing and land use challenges to nuclear development. No designs have been licensed in the U.S.**



Task 2 Appendices



Appendix –Set-aside Target Percentages from Senate Bill 3 REPS

	2010	2012	2015	2018
Solar	0.02%	0.07%	0.14%	0.20%
Swine Waste		0.07%	0.14%	0.20%

	2010	2012	2013	2014
Poultry Waste		170,000 MWH	700,000MWH	900,000MWH

Slide 64

D19 I'm not clear on the distinction on DSM between our assumptions and SB3 REPS

Can this be in a table form

resource	2006 Study	SB3 REPS
solar	excluded on cost	carveout 0.2%
ETC....		

Danp, 12/20/2010

Appendix – EE REPS Compliance

- **Numerous EE measures at residential, commercial & industrial level**
- **Focus on enhancing DR**
- **The following table summarizes the measures by company to date**



Appendix – EE Measures - Residential

Program Description	Progress	Duke	Dominion
A/C Unit - Purchase	Active	Active	Proposed
Appliance Recycling-Freezers	Active	Under Consideration	
Appliance Recycling-Refrigerators	Active	Under Consideration	Rejected
Appliance Recycling-Water Heaters			Rejected
Duct Testing & Repair	Active		Future
Energy Assessments/Audits		Active	Rejected
Energy Efficiency Financing	Pre-REPS		
Geothermal Heat Pumps			Rejected
Heat Pump - Purchase	Active		Future
Heat Pump Tune-Up			Future
Home Energy Comparison Report		Proposed	Rejected
HVAC Tune-up	Active	Under Consideration	
Insulation Upgrades/Attic Sealing	Active		
Lighting	Active	Active	Proposed
Low-Income Audits	Active	Active	Proposed
Low-Income Direct Install	Active	Under Consideration	
Low-Income Rebates		Active	
New ENERGY STAR Construction	Active	Active	Rejected
Solar Water Heating	Pilot		Rejected
Thermal Efficiency Rebate	Pre-REPS		
Window Replacement	Active		

Appendix – EE Measures – Commercial & Industrial

Program Description	Progress	Duke	Dominion
Duct Testing & Repair			Future
Energy Assessments/Audits		Active	Future
HVAC	Active	Active	Proposed
HVAC Tune-up			Rejected
Lighting	Active	Active	Proposed
Motors & Drives	Active	Active	Rejected
Pumps		Active	
Refrigeration	Active		Future



Appendix – Demand Response Measures

Program Description	Progress	Duke	Dominion
Distribution System Voltage Reduction	Active		Future
Central Air Conditioning	Active	Active	
Electric Water Heaters	Active		
Heat Pumps	Active		
Standby Generator Control		Active	Proposed
Curtable Rates	Pre-REPS	Active	Rejected
Hourly Pricing for Incremental Load		Active	
Real-Time Pricing	Pre-REPS		
Thermal Energy Storage Rates	Pre-REPS		
Time-of-Use Rates	Pre-REPS	Active	



Appendix – REPS Matters Considered by NCUC

- **After S.B. 3 was enacted, the NC Utilities Commission initiated a proceeding to develop rules for the law’s implementation (Docket E-100 sub 113). This docket has become the platform for requests for clarification on the law from power suppliers and generators**
- **Additionally, issues have been raised and decided in individual utility dockets (i.e. E-7, Duke’s dedicated docket)**
- **The following table summarizes the main issues that the NCUC has ruled on since passage of the law. Orders are listed in reverse chronological order. Docket numbers provide active hyperlinks to the relevant NCUC order.**



Appendix – REPS Matters Considered by NCUC (continued)

Order Issued	Docket # (w/ link to order)	Description of NCUC findings
12/10/2010	E-100, 113	Extends deadline for obtaining RECs for more than two years' worth of historic generation data to 6/1/2011.
11/23/2010	E-100, 113	Clarifies that utilities will be able to recover the cost of procuring energy to satisfy the collective swine and poultry waste set-asides, even if the unbundled RECs are sold to another NC utility.
10/11/2010	E-7, 939-940	Wood fuel derived from whole trees through primary harvests are considered eligible biomass resource for REPS. Biomass types in statute are examples, not exhaustive list. Declined to issue a comprehensive definition, affirming commitment to evaluate proposed biomass resources on a case-by-case basis.
10/8/2010	E-100, 113	Thermal energy generated from poultry waste is not eligible to satisfy poultry set-aside.
8/13/2010	E-7, 936	Munis and EMCs can count all power (including pumped storage hydropower) from Southeastern Power Administration toward REPS compliance (subject to 30% limit).



Appendix – REPS Matters Considered by NCUC (continued)

Order Issued	Docket # (w/ link to order)	Description of NCUC findings
6/25/2010	E-100, 113	Allows collaborative efforts among electric providers to fulfill poultry litter set-aside (similar to swine waste)
3/31/2010	E-100, 113	Approved a pro-rata allocation mechanism (as proposed by PEC) for meeting poultry and swine waste set-asides. Mechanism divides suppliers' shares of obligation according to share of NC retail electricity sales.
2/12/2010	E-100, 113	Approved joint RFP process for electric suppliers to collectively meet swine waste set-aside. Electric suppliers withdrew their petition to delay and modify the set-aside pending review of the responses to the joint RFP.
1/20/2010	E-100, 113	For facilities using anaerobic digestion of a mix of organic material, only energy generated by the portion of methane gas actually produced from poultry and swine waste is eligible to satisfy those set-asides.



Appendix – REPS Matters Considered by NCUC (continued)

Order Issued	Docket # (w/ link to order)	Description of NCUC findings
9/22/2009	E-100, 113	Clarified that 25% out-of-state limitation applies to the general REPS obligation and to each of the set-asides <i>individually</i> . Dominion is exempt from 25% limitation.
7/27/2009	E-100, 113	Clarified that a utility-owned renewable energy facility in service before 1/1/2007 does not qualify as “new”. Nonutility-owned facility in service before 2007 can only qualify as “new” if it had contract with NC GreenPower prior to 2007.
7/13/2009	E-100, 113	Clarified 5/8 order: for out-of-state CHP facility, electricity delivered to NC utility can be considered in-state, but thermal energy is out-of-state.
6/17/2009	E-100, 113	<p>a. Existing (pre-2007) utility-owned hydro does not qualify, regardless of size or type. New small hydro (increments <10MW) does qualify.</p> <p>b. TVA distributors and out-of-state HQ’d EMCs that have retail customers in NC are subject to REPS requirements. University-owned electric suppliers are not.</p>



Appendix – REPS Matters Considered by NCUC (continued)

Order Issued	Docket # (w/ link to order)	Description of NCUC findings
5/7-5/8/2009	E-100, 113	<p>a. Solar, swine and poultry set-asides have priority over general requirements when the cost cap comes into play. All set-asides have equal priority.</p> <p>b. Set-asides must be fulfilled with energy generated by or delivered to a NC electric power supplier. Unbundled RECs from qualifying energy can be used to satisfy set-asides.</p> <p>c. Allow power supplies to meet swine and poultry set-asides collectively, determining among themselves how best to do it.</p> <p>d. Electricity generated out of state (including customer-sited generation) can only be considered “in state” if it is delivered to utility with NC customers. Out-of-state thermal energy cannot be considered “in state”.</p> <p>e. RECs can be held and sold indefinitely by munis and EMCs, and up to 7 years by IOUs. However, can only be applied to NC REPS up to three years after creation.</p>

Appendix – REPS Matters Considered by NCUC (continued)

Order Issued	Docket # (w/ link to order)	Description of NCUC findings
11/26/2008	E-100, 113	Clarifies that each year's REPS requirements (both general and set-asides) are based on the previous year's actual sales, not forecasts for the current year.
2/29/2008	E-100, 113	Order adopting final rules implementing SB 3



Appendix – Key North Carolina Air Quality Regulations Related to Power Generation

- **Clean Air Act - National Ambient Air Quality Standards (NAAQS)**
 - Sets limits for six “criteria pollutants”: ground-level ozone, NO_x, SO_x, CO, particulate matter <2.5 microns (PM-2.5) and lead.
 - Areas that fail to meet standard (“nonattainment areas”) must submit plans for reaching standards.

- **EPA Clean Air Act Rule Changes**
 - Jan 2011: First regulation of greenhouse gas emissions to begin;
 - By end of 2011: New Maximum Achievable Control Technology (MACT) standard will require coal- and oil-fired plants to reduce emissions of air toxics (e.g. mercury).
 - By 2012: New Transport Rule (replacing court-rejected 2005 Interstate Rule) expected to place stricter limitations on NO_x and SO_x emissions that can drift to other states

- **NC Clean Smokestacks Act (2002)**
 - Required Duke and Progress to reduce coal-fired plant NO_x emissions 77% by 2009 and SO₂ emissions 73% by 2013

