Optimizing Energy Procurement

Pairing Wind and Hydroelectricity

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As Massachusetts makes long-term commitments to purchase low-emissions energy, policymakers should encourage bundling of wind and hydroelectricity in order to optimize consumer and environmental benefits. Proposals currently before the Legislature – including S.1965 proposed by the Baker Administration and S.1757 proposed by Sen. Downing – would authorize utilities to solicit contracts for up to 18.9 terawatt hours (TWh) of hydroelectricity and associated transmission per year, equivalent to approximately one third of Massachusetts' consumption. Hydroelectric imports proposed in these bills can help achieve greenhouse gas reduction requirements and diversify Massachusetts' energy portfolio. However, in order to maximize benefits, reduce total ratepayer costs, and address incentives that could lead to excess transmission costs, onshore wind should be included in any hydroelectric procurement. Pairing onshore wind and hydroelectricity would:

- Reduce total costs;
- Facilitate achievement of Renewable Portfolio Standard (RPS) requirements;
- Maximize energy output, and;
- Avoid excess expenditures on transmission

Cost

Combining wind and hydroelectricity would likely lead to lower overall costs, as Renewable Energy Credits (RECs) would be included in a bundled purchase rather than purchased separately under a hydroelectricity-only procurement.

Under either approach – bundled or hydro-only – the price for hydroelectricity itself would likely be unchanged, with hydroelectricity offered at close to current market prices.[i] Hydroelectric suppliers are able to sell energy into New England, New York, or Ontario and as such are likely to seek the highest available market prices for their energy. Wholesale market prices averaged $52.64/MWh in New England from 2012-2014[ii].

Including wind in the procurement could effectively lower the cost of energy. Wind suppliers are able to finance a portion of development costs through future Renewable Energy Certificate (REC) payments, and thus accept lower rates for *energy* procured in conjunction with RECs. This bundling of wind energy and RECs would be similar to long term contracts for wind signed by Massachusetts utilities' in 2013, when energy and RECs[iii] were purchased for under $80/MWh.[iv] If similar prices for wind are offered in future procurements, Massachusetts would receive the RECs (currently valued at $50.00/MWh[v]), while effectively purchasing energy for ~$30/MWh. When cheaper wind energy is blended with hydroelectricity, the effective price of energy comes down. For example, a mix of 30% wind power at ~$30/MWh and 70% hydroelectricity at $53/MWh would provide a blended mix of ~$46/MWh; compared with $53/MWh for pure hydroelectricity (see figure below).

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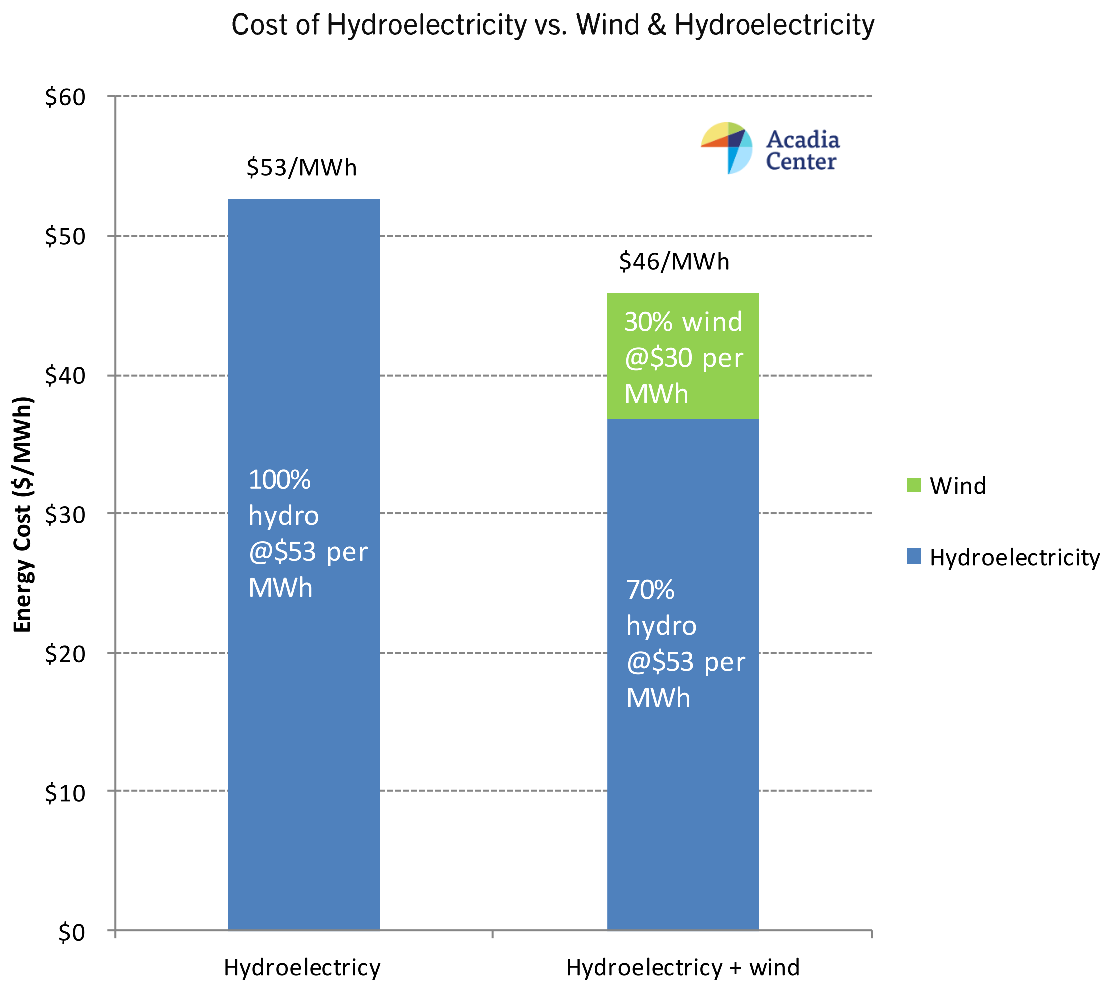

RPS Compliance

Massachusetts' RPS requires utilities to supply 10% of electricity sales from eligible resources[vi] in 2015, rising by 1% annually. Utilities meet their RPS obligations by acquiring RECs, each representing 1MWh of renewable energy. It is important to note that ratepayers will pay for RECs needed to meet the annual RPS target regardless of the procurement approach, and RECs will be needed even if no procurements go forward. So long as procurements are considered, however, parameters should be structured to capture multiple benefits including diversifying energy sources, reducing emissions, and enabling compliance with the RPS. Requiring procurements of wind will additionally facilitate project development, thus reducing costs for compliance with the RPS and driving in-region economic development.

Energy Output

Neither wind farms nor hydroelectric facilities are capable of operating 100% of the time, but pairing wind and hydroelectricity can increase the capacity factor (how often a resource is fully utilized) of transmission lines carrying both resources. When the wind is not blowing, hydroelectricity would fill the lines, and when hydroelectricity is not available due to seasonal variation or curtailment,[vii] wind could help make up for any shortfall. Thus, a blended mix of wind and hydroelectricity would more closely resemble a conventional baseload power plant that can operate nearly all the time in comparison to either wind or hydroelectricity alone.[viii]

Avoiding Excess Transmission Expenditures

Increasing the share of clean electricity resources in Massachusetts' supply mix will require support for large scale and distributed energy resources. Large scale renewables and low carbon resources will require transmission to move energy from remote locations to load centers, but ratepayers should only pay for as much transmission as needed. Concerns about overbuilding transmission are rooted in financial incentives that reward transmission developers for building as much transmission as possible. Transmission developers in Massachusetts earn high returns (in excess of 10.5%[ix]) on reliability-driven transmission expenditures, and correspondingly focus on maximizing transmission expenditures to deliver shareholder returns.[x] In practice, this incentive structure means that building transmission separately for hydroelectricity and for wind would lead to higher returns for transmission developers, even though building transmission to serve both wind and hydroelectricity would be more efficient from a consumer cost perspective.

Policy Solutions

Policymakers can optimize transmission expenditures by requiring a minimum percentage of RPS-eligible resources in each procurement for energy and transmission. Setting a minimum level for RPS-eligible resources would lead project proponents to put forward optimal project designs that reduce energy costs, facilitate RPS achievement, maximize energy output, and minimize transmission expenditures. The capacity factor of wind varies over the year but is approximately 30% on average[xi], and a procurement optimized to balance wind and hydroelectricity would thus contain 30% wind, supported by 70% hydroelectricity to fill in when the wind is not blowing.

Requiring minimum shares of wind in each *procurement* does not preclude a project proponent from submitting a hydro-only project alongside a complementary project with the required amount of RPS-eligible resources. It would, however, require the project proponent to demonstrate that separate projects transmitting wind and hydroelectricity compare favorably to blended projects on overall costs.

For more information:

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Endnotes:

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[i] This fact sheet assumes that hydroelectric imports would come from existing hydroelectric facilities. New hydroelectricity could cost more, but would presumably need to compete with existing facilities on price.
[ii] ISO-NE DALMP available at: http://www.iso-ne.com/isoexpress/web/reports/pricing/-/tree/zone-info
[iii] National Grid's petition for approval of contracts includes energy and RECs, see http://www.mass.gov/eea/docs/dpu/electric/13-147-initial-filing-9-20-13.pdf
[iv] See: https://www.bostonglobe.com/business/2013/09/22/suddenly-wind-competitive-with-conventional-power-sources/g3RBhfV440kJwC6UyVCjhI/story.html
[v] July 2015 REC price from DoE, at: http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=5
[vi] RPS Class I resources include wind, solar, eligible biomass, landfill methane, small hydro, and renewable thermal output. See: http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/rps-and-aps-program-summaries.html
[vii] During the winter of 2014 imports Quebec to New England were curtailed 24 times. See memo included in Heather Hunt 1/31/2014 email "FW_material following 1_24 mtg"), available through archive of emails disclosed by CLF, available at: http://www.clf.org/blog/clean-energy-climate-change/governors-infrastructure-plan/
[viii] In winter months – when New England is in greatest need of non-gas generation – output from both wind and hydro peaks, and in summer months when capacity factors for wind decline, hydro capacity factors are higher. This is illustrated by monthly data from EIA http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_6_07_b). It is worth noting that capacity factors for Canadian hydro resources able to store water are likely higher than EIA's estimates.
[ix] See: http://www.ferc.gov/media/news-releases/2014/2014-2/06-19-14-E-7.asp#.VieOLn6rTIW
[x] For example, analysts at the financial research firm Morningstar write of Eversource: "*Transmission investments and related rate increases are the key earnings growth drivers in our forecasts*." See: http://analysisreport.morningstar.com/stock/research/c-report?t=XNYS:ES&region=usa&culture=en-US&productcode=MLE&cur.
[xi] See http://www.eia.gov/todayinenergy/detail.cfm?id=20112