

Assumptions for levelized cost analysis

General inputs and assumptions

- Shared Inputs
 - Annual Inflation – 2.5%
 - Federal and state blend corporate tax rate – 38%
 - Debt – 50%
 - Cost of debt – 4.5%
 - Equity – 50%
 - Cost of equity – 11%
 - Capacity value – 123,338 \$/MW-yr (Projected annual revenue requirement for combustion turbines in \$/MW-yr, EIA AEO2015 LCOE)
 - Regional capital cost adjustments for non-wind generation
 - MO in SERC Gateway (SRGW) and SPP North (SPNO) (EIA AEO2015)
 - Property tax rate
 - MO – 4%
 - Assessment on commercial property
 - MO – 32%
 - 2016 PTC at 80% value – 19 \$/MWh (IRS Section 45)
 - KS wind capacity factor – 55%
 - MO wind capacity factor – 35% (Based off of wind speed difference between western Kansas resource area and northwest Missouri)
- Input Sensitivities
 - Carbon dioxide price
 - No Carbon Price (low case)
 - Mid – Synapse forecast low case: 15 nominal \$/ton in 2022 to 36 \$/ton in 2050 (2016 Synapse Report, extended through end of plant life in 2051)
 - High – Synapse forecast low case: 20 nominal \$/ton in 2022 to 81 \$/ton in 2050 (2016 Synapse Report, extended through end of plant life in 2051)
 - Natural gas price
 - Low Case – EIA AEO2016 Early Release “High Oil and Gas Resource and Technology” Case electric power delivered forecast: 4.01 \$/Mcf in 2022 to 5.40 \$/Mcf in 2040 (EIA AEO2016 Early Release)
 - Mid – EIA AEO2016 Early Release Reference Case electric power delivered forecast: 5.63 \$/Mcf in 2022 to 9.23 \$/Mcf in 2040 (EIA AEO2016 Early Release)
 - High – EIA AEO2016 Early Release “Low Oil and Gas Resource and Technology” Case electric power delivered forecast: 8.07 \$/Mcf in 2022 to 16.77 \$/Mcf in 2040 (EIA AEO2016 Early Release)

Assumptions on alternatives

- Grain Belt line
 - Electric losses – 6%
 - Overbuild – 105%

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- Curtailment – 0.1%
- Kansas wind
 - Capital cost – 1.64 \$mm/MW (LBL Wind Report)
 - O&M – 23 \$/kW-year (LBL Wind Report) with 1% escalation
 - Tax depreciation – 5-years MACRS
 - Useful life – 25 years
 - Property depreciation – straight line over lifetime to 20% residual value
 - Property tax rate – 15% (Based on Ford County, KS 2015 rates
<https://www.admin.ks.gov/offices/chief-financial-officer/municipal-services/county-tax-levy-sheets/>)
 - Property tax assessment percentage – 25%
(<https://www.admin.ks.gov/offices/chief-financial-officer/municipal-services/county-tax-levy-sheets/>)
 - Property tax – 10-year exemption (Renewable Energy Property Tax Exemption:
http://www.kslegislature.org/li_2016/b2015_16/measures/documents/sb91_02_00_00.pdf)
 - Capacity credit – 19% of nameplate capacity (Capacity credit of MO wind scaled by capacity factor ratio between KS and MO)
- Missouri wind
 - Capital cost – 1.64 \$mm/MW (LBL Wind Report)
 - O&M – 23 \$/kW-year (LBL Wind Report) with 1% escalation
 - Tax depreciation – 5-years MACRS
 - Useful life – 25 years
 - Property depreciation – straight line over lifetime to 20% residual value
 - Property assessment – 40% for first two years, 37% for following two years, then 35% for all following years
(http://stc.mo.gov/files/077_CHAPTER7.7WINDENERGYREV.pdf)
 - Capacity credit – 12.4% of nameplate capacity
(<https://www.misoenergy.org/Library/Repository/Report/2016%20Wind%20Capacity%20Report.pdf>)
- Combined Cycle Gas
 - Utilization rate – 87% (EIA AEO2015)
 - Capital cost – 1.017 \$mm/MW (EIA AEO2015)
 - Fixed O&M – 15.36 \$/kW (EIA AEO2015)
 - Variable O&M – 3.27 \$/MWh (EIA AEO2015)
 - Heat rate – 6,333 Btu/kWh (EIA AEO2015)
 - Carbon intensity – 0.053 tons/mmBtu
 - Tax depreciation – 15-years MACRS
 - Useful life – 30 years
 - Property depreciation – straight line over lifetime to 20% residual value
 - Capacity credit – 76% [0-100 MW], 87% [100-200 MW], 91% [200-300 MW], 93% [300-400 MW] of nameplate capacity (1-EFOR, or Equivalent Forced Outage Rate: Generating Availability Data System)

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- Utility-scale Solar
 - Utilization rate – 21% (NREL System Advisor Model)
 - Capital cost – 2.32 \$mm/MW ([LBL Solar Report](#))
 - Fixed O&M – 17 \$/kW ([LBL Solar Report](#))
 - Variable O&M – 0 \$/MWh ([LBL Solar Report](#))
 - Investment tax credit – 30% of capital costs
 - Tax depreciation – 5-years MACRS
 - Useful life – 25 years
 - Property tax – exempt (Solar Property Tax Exemption: <http://programs.dsireusa.org/system/program/detail/5431>)
 - Capacity credit – 48% of nameplate capacity (Assumed 1-axis tracking and 10% penetration levels in MO, NREL: <http://www.nrel.gov/docs/fy06osti/40068.pdf>)

References

[EIA AEO2015](#) – *Annual Energy Outlook 2015: Electricity Market Module*. (EIA)
<http://www.eia.gov/forecasts/aeo/assumptions/pdf/electricity.pdf>

[EIA AEO2015 LCOE](#) – *Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook*. (EIA)
https://www.eia.gov/forecasts/aeo/pdf/electricity_generation.pdf

[EIA AEO2016](#) – *Annual Energy Outlook 2016 Early Release*. (EIA)
<http://www.eia.gov/forecasts/aeo/index.cfm>

[LBL Solar Report](#) – *Utility Scale Solar 2014*. (LBL) https://emp.lbl.gov/sites/all/files/lbnl-1000917_0.pdf

[LBL Wind Report](#) – *Wind Technologies Market Report 2014*. (LBL)
<http://energy.gov/sites/prod/files/2015/08/f25/2014-Wind-Technologies-Market-Report-8.7.pdf>

[Synapse Report](#) – *2016 Carbon Dioxide Price Forecast*. (Synapse) <http://www.synapse-energy.com/project/synapse-carbon-dioxide-price-forecast>