General inputs and assumptions

- Shared Inputs
  - Annual Inflation – 2.5%
  - Corporate tax rate – 35%
  - Debt – 50%
  - Cost of debt – 5.5%
  - Equity – 50%
  - Cost of equity – 12%
  - Capacity value – 95,659 $/MW-yr (Projected annual revenue requirement for combustion turbines in $/MW-yr, EIA AEO2013 forecast)
  - Regional capital cost adjustments for non-wind generation
    - KS in SPP North (SPNO) (EIA AEO2013)
    - MO in SERC Gateway (SRGW) and SPP North (SPNO) (EIA AEO2013)
  - Property tax rate
    - MO – 4%
  - Assessment on commercial property
    - MO – 32%
- Input Sensitivities (reference case)
  - 2014 PTC value – 23 $/MWh (IRS Section 45)
  - Carbon dioxide price – Synapse forecast mid case: 15 $/ton in 2020 to 60 $/ton in 2040 (Synapse Report)
  - Natural gas price – EIA AEO2014 electric power forecast: 5.68 $/Mcf in 2018 to 13.82 $/Mcf in 2040 (EIA AEO2014)
  - KS wind capacity factor – 55%
  - MO wind capacity factor – 30% (Estimated from http://www.windpoweringamerica.gov/wind_resource_maps.asp?stateab=mo)

Assumptions on alternatives

- Grain Belt line
  - Electric losses – 5%
- Kansas wind
  - Utilization rate – see KS wind capacity factor above
  - Capital cost – 1.75 $mm/MW (includes regional cost adjustments according to LBL Wind Report)
  - O&M – 7.5 $/MWh (LBL Wind Report) with 1% escalation
  - Tax depreciation – 5-years MACRS
  - Useful life – 25 years
  - Property tax – exempt (Renewable Energy Property Tax Exemption: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=KS02F&re=0&ee=0)
  - Capacity credit – 17.1% of nameplate capacity (Capacity credit of MO wind scaled by capacity factor ratio between KS and MO)

- Missouri wind
  - Utilization rate – see MO wind capacity factor above
  - Capital cost – 1.75 $mm/MW (includes regional cost adjustments according to LBL Wind Report)
  - O&M – 7.5 $/MWh (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)
  - Property tax incentive – 50% abatement for 10 years (http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO117F&re=0&ee=0)
  - Capacity credit – 9.3% of nameplate capacity (https://www.misoenergy.org/Library/Repository/Study/LOLE/2014%20Wind%20Capacity%20Report.pdf)
  - TOD adjustment – 98% (Missouri EWITS data compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
- Pulverized Coal
  - Utilization rate – 85% (EIA AEO2013)
  - Capital cost – 2.934 $mm/MW (EIA AEO2013)
  - Fixed O&M – 31.18 $/kW (EIA AEO2013)
  - Variable O&M – 4.47 $/MWh (EIA AEO2013)
  - Heat rate – 8,800 Btu/kWh (EIA AEO2013)
  - Carbon intensity – 0.093 tons/mmBtu (Bituminous coal)
  - Tax depreciation – 15-years MACRS
  - Useful life – 30 years
  - Property depreciation – straight line over lifetime to 20% residual value
  - Capacity credit – 88% [0-100 MW], 93% [100-200 MW], 93% [200-300 MW], 93% [300-400 MW], 92% [400-600 MW] of nameplate capacity (1-EFOR, or Equivalent Forced Outage Rate: Generating Availability Data System)
  - TOD adjustment – 104% (Assumed constant generation compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
  - Coal price – EIA AEO2014 forecast: 2.80 $/mmBtu in 2018 to 5.29 $/mmBtu in 2040 (EIA AEO2014)
- Combined Cycle Gas
  - Utilization rate – 87% (EIA AEO2013)
  - Capital cost – 1.006 $mm/MW (EIA AEO2013)
  - Fixed O&M – 15.1 $/kW (EIA AEO2013)
  - Variable O&M – 3.21 $/MWh (EIA AEO2013)

  - Heat rate – 6,333 Btu/kWh (EIA AEO2013)
  - 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)
  - TOD adjustment – 104% (Assumed constant generation compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
- Nuclear
  - Utilization rate – 90% (EIA AEO2013)
  - Capital cost – 5.429 $mm/MW (EIA AEO2013)
  - Fixed O&M – 91.65 $/kW (EIA AEO2013)
  - Variable O&M – 2.1 $/MWh (EIA AEO2013)
  - Average fuel cost (including waste management) – 7.5 $/MWh (NEI: http://www.nei.org/Knowledge-Center/Nuclear-Statistics/Costs-Fuel,-Operation,-Waste-Disposal-Life-Cycle)
  - Tax depreciation – 15-years MACRS
  - Useful life – 40 years
  - Property depreciation – straight line over lifetime to 20% residual value
  - Capacity credit – 98% [<800 MW] of nameplate capacity (1-EFOR, or Equivalent Forced Outage Rate: Generating Availability Data System)
  - TOD adjustment – 104% (Assumed constant generation compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)
- Utility-scale Solar
  - Utilization rate – 19.2% (PV generation obtained using NREL PV-Watts for Columbia, MO http://rredc.nrel.gov/solar/calculators/pvwatts/version1/)
  - Capital cost – 3.805 $mm/MW (EIA AEO2013)
  - Fixed O&M – 21.37 $/kW (EIA AEO2013)
  - Variable O&M – 0 $/MWh (EIA AEO2013)
  - Investment tax credit – 30% of capital costs
  - Tax depreciation – 5-years MACRS
  - Useful life – 25 years
  - Property tax – exempt (Solar Property Tax Exemption: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO122F&re=0&ee=0)
  - Capacity credit – 62% of nameplate capacity (Assumed 2-axis tracking and 10% penetration levels in MO, NREL: http://www.nrel.gov/docs/fy06osti/40068.pdf)
  - TOD adjustment – 116% (PV generation obtained using NREL PV-Watts for Columbia, MO http://rredc.nrel.gov/solar/calculators/pvwatts/version1/ and is

compared with KS wind, calculated from simulated hourly LMPs at GBX Palmyra Tap drop-off point and wind profile provided by DNV GL)

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