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ZERO CARBON, FLEXIBLE, AND EFFICIENT POWER
POTENTIAL NATURAL GAS RETRO FITS

Fuel: Natural gas, Hydrogen

Efficiency/Heat rate: 55-60% / 6200-5700 Btu/kWh

Feature: Retrofittable

GHG emissions: 100% CO2 Capture

Air pollutants: Zero NOx

Scale: 1-100th MWs

LCOE: 60-140 $/MWh @ 90-30% CF

11/20/2019
California NG by the number (2018)

- **90,691 GWh** power generated
- 46% of total in state generation
- **40 MMtCO₂e** Emissions (NG)
- 3-5$/MMBtu fuel cost
- **44 GW** Capacity
- 36% Capacity factor
- 43% Overall fleet Efficiency
- **200 miles** of NG infrastructure
IDEAL SPEC SHEET OF NEW NG TECHNOLOGIES

1. Provide cost effective power
2. Provide Flexibility and Reliability
3. Mitigate Climate Change
4. Improve Air Quality

Simultaneously!
NATURAL GAS COAT TRENDS

**U.S. Fuel Prices (USD/MBtu)**

- Coal (US avg)
- Oil (WTI)
- NG (Henry Hub)

**U.S. Shale Gas Production (Bcfd)**

- Antrim (MI, IN & OH)
- Woodford (OK)
- Fayetteville (AR)
- Haynesville (LA & TX)
- Utica (OH, PA & WV)
- Rest of US 'shale'
- Bakken (ND & MT)
- Barnett (TX)
- Eagle Ford (TX)
- Marcellus (PA, WV, OH & NY)
- Permian (TX & NM)
- Rest of U.S.

Source: EIA 2018
BARRIER TO ENTRY IN A NUTSHELM

5 min wholesale price ($/MWh)

Electricity Price distribution($/MWh)

Source: CAISO 2018