



(This is a Request for Information only - Complete Pages 1 and 2 for each initiative)

**Title of Proposed Initiative:** Low cost, fuel flexible, high reliability Micro-DG/CHP

**Investment Areas** (Check one or more) – For definitions, see First Triennial Investment Plan, page 12:

- Applied Research and Development  
 Technology Demonstration and Deployment  
 Market Facilitation

**Electricity System Value Chain (Check only one):** See CPUC Decision 12-05-037, Ordering Paragraph 12.a. [http://docs.cpuc.ca.gov/PublishedDocs/WORD\\_PDF/FINAL\\_DECISION/167664.PDF](http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

- Grid operations/market design  
 Generation  
 Transmission  
 Distribution  
 Demand-side management

California Energy Commission

**DOCKETED**

**12-EPIC-01**

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**Issues and Barriers:** Current deployment on-site DG/CHP systems (microturbines, fuel cells, reciprocating engines) have found limited acceptance at least in part due to high initial costs and high operations and maintenance costs. In the case of microturbines and fuel cells, the exotic, “high tech=high level of trouble” perception has added to the lack of adoption. Additionally, despite having a “Feed-in-Tariff” option for excess generation, adoption of this program has been fraught with difficulties and hurdles for end users; as such, DG/CHP that is sized for facility needs rather than producing excess to sell back to the grid is favored. Finally, current DG/CHP systems are not fuel flexible and as such are developed for specific fuel streams and fuel compositions that results in semi-custom systems that cannot take advantage of economies of scale for production of multiples of the same system

**Initiative Description and Purpose:** The development of low cost, fuel flexible, DG/CHP system sized 30 kW or less (aka micro DG/CHP) will find applications in greater numbers of facilities that cannot support larger generation capabilities without back feeding to the grid or needing to pursue Feed In Tariff. Smaller systems would also permit redundancy and greater turn-down capability through staging of units. The initiative looks to capitalize upon knowledge and technology of existing, high volume subsystems (automotive based prime movers, automotive based emissions control systems, solar PV inverter and facility connectivity hardware). Goals for “low cost micro DG/CHP” systems would be (1) installed turnkey prices on the order of \$1000/kw, (2) O&M cost less than 2-cent/kw-hr and (3) levelized cost of electric power of < 12-cents/kw-hr (at \$5 /MMbtu gas price). Fuel flexibility would define and permit application of the same system (and hence employ economies of scale) on fuels ranging from 500 btu/scf to 2500 btu/scf (e.g. ADG, natural gas, propane) with no system modifications and “on the fly”.

**Stakeholders:**

Southern California Gas / Sempra, other state gas utilities, waste water treatment facilities, air quality management districts.

**Background and the State-of-the-Art:** Existing microturbine and fuel cells do not address cost effective, low power output levels proposed for this purpose. Use of low cost automotive based DG/CHP systems has been in place for many years. However, the systems have suffered from reliability and service issues and emissions that have limited their application (at least in the SCAQMD territory) Furthermore, they do not address the goal of less than 30 kW output and have limited fuel flexibility. Research initiatives for stationary power at Mazda (Japan) based upon their rotary engine has shown extraordinarily long life and reliability. Inherently fuel flexible, the same engine can operate on hydrogen, gasoline, and propane. Based upon high volume production engines, the cost per engine is only about 5% of the cost of a replacement Capstone MTG engine.

**Justification:**

Wide spread deployment of micro DG/CHP at the price point goals would find applications in a wide range of facilities including retail, hotel, medium density housing (apartment/condo). While the specific generation capacity size of the sector(s) addressed is not defined at this point, it would be easily conceivable that the micro-DG/CHP sector could comprise 50% of the Governor's goal of 18.5 GW of "Clean Energy Jobs" for both local DG and CHP capacity improvements; this would translate to approx. 200,000 units (at 25 kW each). All construction could be readily supported in California with jobs in both system construction and subsystem assembly. The benefits of micro-DG/CHP are the same as all DG/CHP including environmental benefits from reduced CO2, grid support/reliability and resultant stabilization of electric rates,

**Ratepayer Benefits (Check one or more):**

- X Promote greater reliability
- X Potential energy and cost savings
- Increased safety
- X Societal benefits
- X Environmental benefits – specify: Overall increased thermal efficiency=lower CO2 emissions
- GHG emissions mitigation/adaptation in the electricity sector at the lowest possible cost
- Low emission vehicles/transportation
- Waste reduction
- X Economic development

Describe specific benefits (qualitative and quantitative) of the proposed initiative

Development of low cost, fuel flexible micro DG/CHP will permit wide spread deployment at facilities and in numbers that current DG/CHP do not address. The increased deployment results in job creation associated with the construction of units in state and the installation. Increased overall thermal efficiency as compared to grid + boiler systems will reduce CO2 emissions and reduce overall fuel consumption resulting in cost savings.. Increased grid support and reliability has direct societal benefits in both resource assurance and in reduced cost through mitigation of additional grid generation, transmission and distribution.

**Public Utilities Code Sections 740.1 and 8360:**

Please describe how this technology or strategy addresses the principles articulated in California Public Utilities Code Sections 740.1 and 8360. The California Public Utilities Code is available online at [www.leginfo.ca.gov/cgi-bin/calawquery?codesection=puc](http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=puc).