



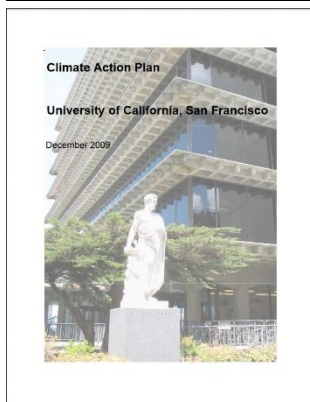
## Carbon Action Planning University of California, San Francisco



### UCSF Strategic Energy Plan 2008:

In her role as Director of Facilities Services for UCSF, Maric Munn oversaw the creation of a Strategic Energy Plan that provided the blueprint for energy efficiency project investments at the campus. The report identified approximately \$28 million in Energy Efficiency projects with an average payback of approximately 5 years and saving 22 million kWh of electricity and 2 million therms of natural gas per year.

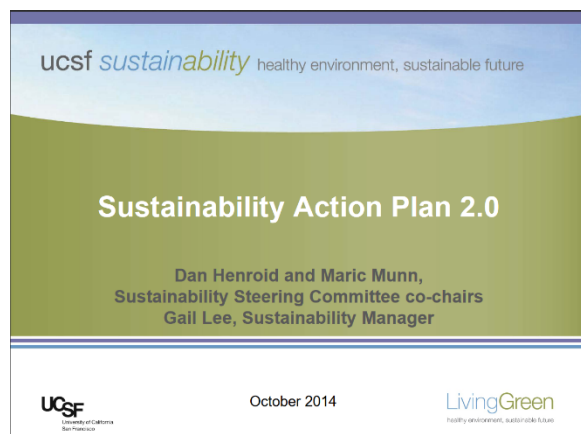
### UCSF Carbon Action Plan 2009:



In her role as Director of Facilities Services for UCSF, Ms. Munn was a major contributing author to UC SF's original carbon action plan to chart how UCSF could meet its original carbon reduction goal of 1990 levels by 2020. She also was a major author of the 2016 plan update which included strategies on how the campus could meet its far more ambitious goal of carbon neutrality by 2025. She led the analysis and development of the sections on Clean Energy and Sustainable Operations.

[https://sustainability.ucsf.edu/upload/livinggreen/files/ucsf\\_cap\\_09.pdf](https://sustainability.ucsf.edu/upload/livinggreen/files/ucsf_cap_09.pdf)

### UCSF Sustainability Action Plan 2014:

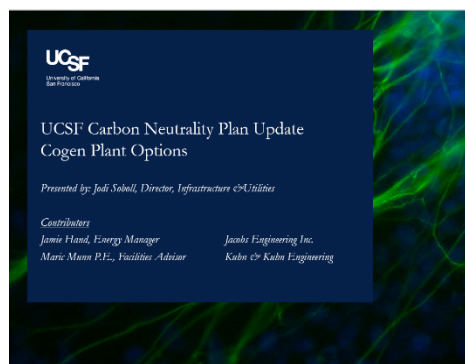


In her role as the campus co-chair of the UCSF Sustainability Steering Committee, Ms. Munn oversaw the development of the UCSF Sustainability Action Plan. In addition to her role in overall plan development, Ms. Munn took the lead in developing the Sections of the Plan relating to Carbon Neutrality and Sustainable Operations. This work included leading charettes to gain a variety of stakeholder input, providing options analysis and developing key performance indicators (KPIs) to track progress.

[https://sustainability.ucsf.edu/upload/livinggreen/files/Final\\_Draft\\_SAP2\\_2-24.pdf](https://sustainability.ucsf.edu/upload/livinggreen/files/Final_Draft_SAP2_2-24.pdf)

[https://sustainability.ucsf.edu/upload/livinggreen/files/SAP2.0\\_ResultsFINAL.pdf](https://sustainability.ucsf.edu/upload/livinggreen/files/SAP2.0_ResultsFINAL.pdf)

## UCSF Climate Action Plan – Cogeneration Plant Options Study 2018:



In recognition that UCSF's major source of carbon emissions is its 14 MW cogeneration plant located at the UCSF Parnassus campus, Ms. Munn created an options study to explore alternatives for delivering central plant utilities to each of UCSF's two major campuses with the goal of: carbon neutrality, reliable operations and cost effectiveness driving the effort. The work included developing a detailed "Business as Usual" base case to model energy consumption and utility and carbon mitigation pricing for the 20-year study period.

The options studied for the Parnassus campus included: removing one of two gas turbines; replacing both gas turbines with a high temperature central heating hot water plant; replacing the central plant heating plant with distributed boilers; and electrification of the campus.



Mission Bay - Options Analysis Preliminary Results

Option	Reliability	Additional Capital Investment <sup>1</sup>	Annual Savings <sup>2</sup>	Simple Payback	GHG in 2025 (M/yr)
1 Status Quo	Low				1,000
2 Install heat recovery chiller plus thermal energy storage	Low	\$6M	\$1,400	4 years	1,000
3 Install condensing boilers at buildings	Low	\$1M	\$150k	7 years	770
4 All electric boilers at buildings	Very Low	To be determined	TBD	TBD	6
5 Install Fuel Cell	High	\$200M	\$26k	753 years	5,000
6 3 <sup>rd</sup> Party Build/Own/Operate cogeneration plant	High	\$0	\$600k	N/A	1,000

Notes:  
<sup>1</sup> include costs of carbon offsets at \$10.00 per tonne

Carbon Reduction Strategies - Financial Analysis Parnassus Central Utility Plant (PCUP)

Option	Reliability	Additional Capital Investment	Annual Operating Costs	Simple Payback	GHG in 2025 (M/yr)
1 Status Quo	High Reliability		\$16.5M		1,000
2 Shut down 1 turbine	Moderate	\$2M**	\$17.2M	N/A	1,000
2a Replace 1 turbine with 5.6 MTR fuel cell	Moderately High	\$63M	\$16.0M	+100 yrs	1,000
2b Replace 1 turbine with 48 MTR battery storage	Moderate	\$202M	\$17.1M	+100 yrs	1,000
3 Shut down 2 turbines	Low	\$43M**	\$21.3M	N/A	1,000
4 Replace steam system with HMT - shut down 2 turbines	Low	\$200M (if done all at once)**	\$19.85M	N/A	1,000
4a Add heat recovery chiller to option 4	Low	\$225M	\$19.85M	N/A	1,000
5 All Electric	Very Low	\$100M	\$22.74M	N/A	1,000

Notes:  
<sup>1</sup> include costs of carbon offsets at \$10.00 per tonne plus alternate costs of \$10.00 per tonne  
<sup>2</sup> Existing heating boilers may need major investment to be put into full service  
<sup>3</sup> Adding ESEF distribution piping at various locations with other Parnassus projects would drive this cost down

The options studied for the Mission Bay campus included: Installing heat recovery chillers and thermal energy storage; installing fuel cells; replacing central plant heating with distributed condensing boilers; electrification; and implementing a 3<sup>rd</sup> party owned and operated cogeneration plant. The results of this study were presented at a UC Systemwide Central Plant Strategies Workshop in June 2018.