 **Society of Depreciation Professionals Conference**

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**Hydro Decommissioning**

Stephanie Maggard  
Pacific Gas and Electric Company  
September 11, 2017

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 **Agenda**

- Overview of PG&E's Hydro portfolio
- Hydro decommissioning in the U.S.
- Why decommission a Hydro facility?
- PG&E's experience with Hydro decommissioning
- Is there a need for a Hydro decommissioning fund?

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 **PG&E System Overview**

**Headquarters**  
San Francisco, CA

**Service Area**  
70,000 square miles in northern and central California


**Service Area Population**  
16 million people (or about 1 of every 20 Americans)

**Distribution Customer Accounts**  
5.4 million electric, 4.3 million gas

**Employees**  
Approximately 23,000

**System**

- 160,000 miles of electric transmission and distribution (T&D) lines
- 49,000 miles of natural gas T&D pipelines
- 7,700 megawatts of utility-owned generation



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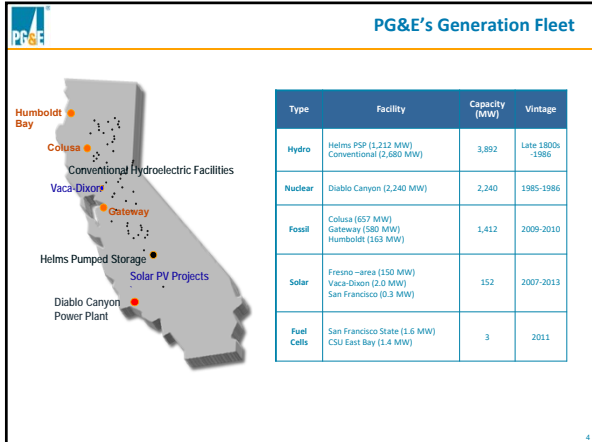
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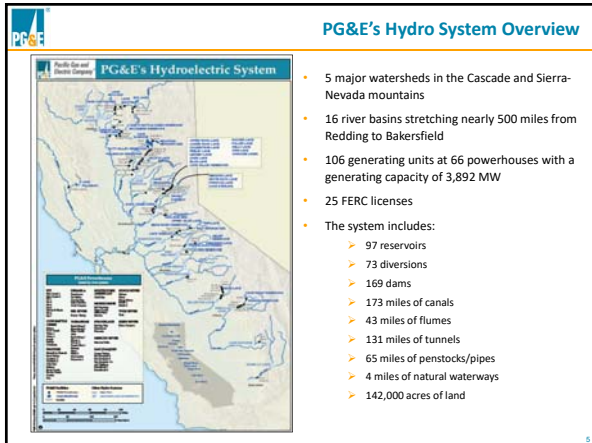
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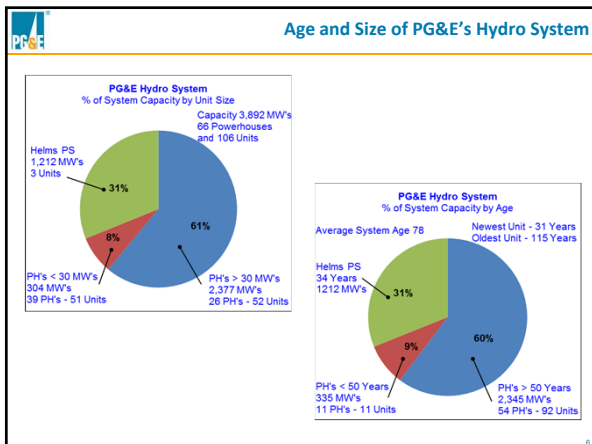
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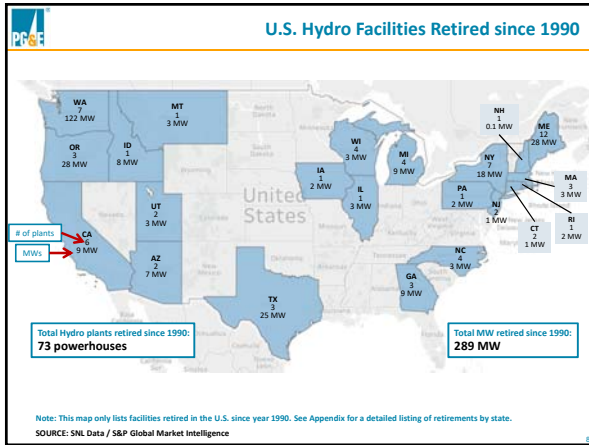
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### PG&E's Hydro Project License Timeline

FERC LICENSE	PROJECT NAME	NORMAL MW CAPACITY	LICENSE EXPIRES	NOI FILING DEADLINE	APPLICATION FILING DEADLINE	LICENSE STATUS
2107	Pow	120	9/30/2003	9/30/1998	1/2/2004	Application filed 12/16/2003
2105	Upper NF Feather River	362.8	10/31/2004	10/31/1999	10/31/2002	Application filed 10/23/2002
506	Manitou Creek Dam	5	3/27/2007	3/27/2002	3/27/2005	License Surrender Application filed 5/23/2009
803	DeSable Centreville	26.4	10/11/2009	10/11/2004	10/11/2007	Application filed 10/12/2007 Withdrawal filed 2/16/2011
2106	McCloud - PH	364	7/31/2011	7/31/2006	7/31/2009	Application filed 7/14/2009
2110	Drum Spooling	100.1	4/30/2013	4/30/2008	4/30/2011	Application filed 4/12/11
620	South Creek	65	12/31/2018	12/31/2013	12/31/2016	Application filed 12/22/2016
77	Forster Valley	9.2	4/14/2012	4/14/2017	4/14/2010	License Amendment received 1/28/04. License received 10/4/1988. NOI filed 4/6/17
1061	Phoenix	2	8/31/2012	8/31/2017	8/31/2010	License received 9/20/1992. NOI filed 8/22/17
96	Kerkhoff #1 and #2	180.4	11/30/2012	11/30/2017	11/30/2010	License Amended in 2013. License received 11/6/1976
1403	Narrows	12	1/31/2013	1/31/2018	1/31/2011	License received 2/11/1995
175	Baldy #1 and #2	139	4/30/2016	4/30/2011	4/30/2014	License received 4/14/1980
2103	Hyatt	112	4/30/2016	4/30/2011	4/30/2014	License received 5/28/1976
1121	Battle Creek	37.9	7/31/2016	7/31/2011	7/31/2014	License received 8/13/1976
137	Mohokulua River	224.5	9/30/2011	9/30/2006	9/30/2009	License received 10/11/2001
1962	Rock Creek-Cresla	195.7	9/30/2011	9/30/2006	9/30/2009	License received 10/21/2001
2061	Hart Creek #1 and #2	17	9/30/2012	9/30/2007	9/30/2010	License received 10/30/2002
1101	Tule River	6.4	7/31/2013	7/31/2008	7/31/2011	License received 12/20/2003
178	Kern Canyon	11.5	1/31/2019	1/31/2014	1/31/2017	License received 2/25/2000
1988	Haas-Kings River	196	2/28/2041	2/28/2016	2/28/2019	License received 3/6/2001
2067	PH #1	61	2/28/2042	2/28/2017	2/28/2040	License received 3/15/2001
213	PH #1, #4 and #6	105	4/30/2043	4/30/2018	4/30/2041	License received 7/22/2007
1354	Chesna Valley	28.7	9/30/2043	9/30/2018	9/30/2041	License received 9/26/2003
2130	Spring Gap-Stamulus	98	3/31/2047	3/31/2042	3/31/2045	License received 4/14/2000
2155	Chil Bar	7	7/1/2064	7/1/2059	7/1/2062	License Received 8/20/2014
Subtotal MW:		3986.1				

\* This table does not include the Company's 1 FERC non-jurisdictional powerhouses, which add another 7.7 MW, making the Normal MW Capacity Total 1,873.8 MW.




### Elwha River in WA - One of the Largest Dam Removal Projects in U.S. History

**Before**

"The full cost of removing the large Elwha River dams (47- and 90-meter-high), the highest US dams ever funded for removal, are expected to exceed \$200 million over a 20-year period."

*Source - Report from International Rivers Network:  
<https://www.internationalrivers.org/sites/default/files/attached-files/damremovalbrochure.pdf>*

**After**

 **Hydro Assets are no longer "Forever Assets"**

There are several factors that may lead to the decommissioning of Hydro assets

- High cost of operation relative to alternatives
  - Significant costs to relicense and implement new license conditions
  - Significant investment needed to address aging assets/equipment failure
  - Disproportionate infrastructure costs – maintenance/repair of conveyance systems, roads, bridges, etc.
- Changing energy markets
  - Energy prices continue to fall
  - Many low-cost alternatives for renewable energy
  - Load for bundled utility service is shrinking
- Risk management
  - Risks of dam/canal failure
  - Public and worker safety
  - Flow requirements for recreation and fish
- Environmental habitat for endangered species

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 **PG&E's Experience with Hydro Decommissioning**

- PG&E surrendered its **Kilarc-Cow Creek** license (5 MW) in 2007 and submitted a decommissioning plan in 2009, which is awaiting FERC approval
- PG&E filed to withdraw its application to relicense its **DeSabra-Centerville** license (26 MW) in February 2017:
  - License expired in 2009. Filed relicensing application in 2007.
  - Renewable energy market is becoming increasingly more competitive
  - Customer demand for PG&E's energy supply is declining due to customer-owned roof-top solar and community choice aggregation programs
  - Expected costly license conditions and operating requirements for the new license
  - FERC instructed PG&E to seek a new owner for the Project and PG&E is currently conducting an auction for the Project.
  - If there is no acceptable buyer, PG&E will refile its withdrawal notice, and the project may be decommissioned.
- PG&E evaluates Hydro Project economics in its evaluation of relicensing decisions
  - Where possible, PG&E is exploring other potential alternatives for projects
  - PG&E is conducting decommissioning studies for projects that are marginally economic to ensure that all options are considered, and that PG&E chooses the least-cost alternative for its customers
- PG&E is benchmarking with other utilities with similar issues to learn from their experiences

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 **Is there a need for a Hydro Decommissioning fund?**

- Hydro assets have historically been considered "forever assets". More hydro facilities will be decommissioned going forward.
- Currently hydro decommissioning costs are recovered as incurred through a balancing account because of: a) uncertainty in timing based on regulatory approvals and b) uncertainty in cost forecasts (but this is not our preferred approach)
- Collecting decommissioning funds over the remaining lives of the Hydro assets, would help preserve inter-generational equity among those benefiting from the energy produced
- Need to balance rate pressures with inter-generational equity issues
- Need to determine how to structure a decommissioning reserve
  - Site-specific or general bucket?
  - Entire portfolio or subset (small, upcoming license expirations)?
  - Detailed cost estimates or percent of plant balance?
  - Part of depreciation reserve, or fund a trust?
  - Collect from bundled (generation) or all customers?

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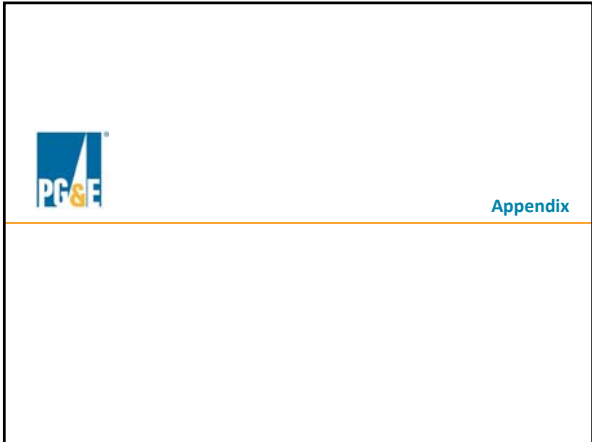
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**Appendix – Hydro Plants Retired Since 1990 Sorted by State**

State	Owner	Power Plant	Year Retired	Total Capacity (MW)	State	Owner	Power Plant	Year Retired	Total Capacity (MW)
AK	Alaska Public Service Company	Chitina	2002	5.8	CA	California Public Service Company	Irving	2005	1.6
CA	Southern California Edison Company	San Geronimo 2	1998	0.8	CA	Southern California Edison Company	San Geronimo 1	2001	1.5
CA	Southern California Edison Company	San Geronimo 2	2007	0.84	CA	Southern California Edison Company	San Geronimo 2	2007	0.84
CA	Yosemite National Park	Fossil	2008	2.8	CA	Yosemite National Park	Fossil	2008	2.8
CA	San Diego County Water Authority	Aravido Hydro Facility	2011	2.1	CA	San Diego County Water Authority	Aravido Hydro Facility	2011	2.1
CA	Pacific Gas and Electric Company	Coal Canyon	2013	1	CA	Pacific Gas and Electric Company	Coal Canyon	2013	1
CT	FirstLight Power Resources, Inc.	Burlam	2000	0.32	CT	FirstLight Power Resources, Inc.	Burlam	2000	0.32
CT	FirstLight Power Enterprises, Inc.	Halsbrooke	2000	0.8	CT	FirstLight Power Enterprises, Inc.	Halsbrooke	2000	0.8
GA	Georgia Power Company	Barnett Shovals	2010	2.8	GA	Georgia Power Company	Barnett Shovals	2010	2.8
GA	Edgley & Phipps Hydro Co., Inc.	Edgley & Phipps	2011	4.2	GA	Edgley & Phipps Hydro Co., Inc.	Edgley & Phipps	2011	4.2
GA	Portland Associates	Portland Hydro	2016	2.2	GA	Portland Associates	Portland Hydro	2016	2.2
HI	Likiep Plantation Co Ltd	Likiep Plantation Co	2002	1.3	HI	Likiep Plantation Co Ltd	Likiep Hydro	2016	1.1
IA	MidByke Sagar Co Ltd	Kalshon Hydro	2016	1.1	IA	Center Rapids Hydro Dam	Center Rapids	2008	2.1
IA	Center Rapids Hydro Dam	Center Rapids	2008	2.1	IA	Center Rapids Hydro Dam	Center Rapids	2008	2.1
ID	Multi-Owned	Cove	2008	7.5	ID	Multi-Owned	Cove	2008	7.5
IL	Commonwealth Edison Company	Dixon	1993	3	IL	Commonwealth Edison Company	Dixon	1993	3
MA	Massachusetts Water Resources Authority	Winson Dam Power Station	1991	1.2	MA	Massachusetts Water Resources Authority	Winson Dam Power Station	1991	1.2
MA	Merrimack Paper Co Inc	Merrimack Paper Company	2005	1.5	MA	Merrimack Paper Co Inc	Merrimack Paper Company	2005	1.5
MA	Riverdale Mills Corporation	Riverdale Mills Hydro	2008	0.1	MA	Riverdale Mills Corporation	Riverdale Mills Hydro	2008	0.1
ME	Multi-Owned	Small Hill	1999	1.18	ME	Multi-Owned	Small Hill	1999	1.18
ME	NextEra Energy Resources LLC	Ledgewick	1999	0.2	ME	NextEra Energy Resources LLC	Ledgewick	1999	0.2
ME	NextEra Energy Resources LLC	Androscoggin Mill Lower	1999	0.26	ME	NextEra Energy Resources LLC	Androscoggin Mill Lower	1999	0.26
ME	FPL Energy Maine Incorporated	Bates Mill Lower	1999	0.45	ME	FPL Energy Maine Incorporated	Bates Mill Lower	1999	0.45
ME	NextEra Energy Resources LLC	Katahdin Falls - Upper	1999	0.35	ME	NextEra Energy Resources LLC	Katahdin Falls - Upper	1999	0.35
ME	NextEra Energy Resources LLC	Katahdin Falls - Lower	1999	0.82	ME	NextEra Energy Resources LLC	Katahdin Falls - Lower	1999	0.82
ME	FPL Energy Maine Incorporated	Fort Indian	2002	1.4	ME	FPL Energy Maine Incorporated	Fort Indian	2002	1.4
ME	FPL Energy Maine Incorporated	Confidential Mills	2008	1.4	ME	FPL Energy Maine Incorporated	Confidential Mills	2008	1.4
ME	FPL Energy Maine Incorporated	Bates Mill Upper	2008	3.9	ME	FPL Energy Maine Incorporated	Bates Mill Upper	2008	3.9
ME	FPL Energy Maine Incorporated	H&M	2008	1.8	ME	FPL Energy Maine Incorporated	H&M	2008	1.8
ME	Penobscot River Restoration Trust	Great Works Hydro	2012	7.7	ME	Penobscot River Restoration Trust	Great Works Hydro	2012	7.7
ME	Penobscot River Restoration Trust	Yallow	2013	8.9	ME	Penobscot River Restoration Trust	Yallow	2013	8.9
MI	Lansing Board of Water & Light	Moscow Park	1993	1	MI	Lansing Board of Water & Light	Moscow Park	1993	1
MI	Tower Island Limited Partnership	Tower Island	2001	0.8	MI	Tower Island Limited Partnership	Tower Island	2001	0.8
MI	Tawaslee City of	Burdman Hydro	2008	1	MI	Tawaslee City of	Burdman Hydro	2008	1
MI	Ypsilanti Board of Water Company	North Fork	2016	6.3	MI	Ypsilanti Board of Water Company	North Fork	2016	6.3
NC	Carroll Park and Biosciences, LLC	Carroll Park	2000	2	NC	Carroll Park and Biosciences, LLC	Carroll Park	2000	2
NC	Northeast Energy, LLC	Steele Shoals	1998	0.7	NC	Northeast Energy, LLC	Steele Shoals	1998	0.7
NC	Northeast Energy, LLC	Spencer Mountain	1998	0.84	NC	Northeast Energy, LLC	Spencer Mountain	1998	0.84
NC	Northeast Energy, LLC	Wata	1998	1.2	NC	Northeast Energy, LLC	Wata	1998	1.2
NC	Duke Energy Carolinas, LLC	Oklahoma	2010	0.3	NC	Duke Energy Carolinas, LLC	Oklahoma	2010	0.3
NH	Tibbetts Rubber Co Inc	Tibbetts Rubber Co HY	2011	0.1	NH	Tibbetts Rubber Co Inc	Tibbetts Rubber Co HY	2011	0.1
NJ	FiberMark, Inc	Fiber Mark HY	2008	0.3	NJ	FiberMark, Inc	Fiber Mark HY	2008	0.3
NJ	International Process Plants and Equipment	Hightstown	2009	0.4	NJ	International Process Plants and Equipment	Hightstown	2009	0.4
NY	Multi-Owned	Mills Mills 172	1995	0.22	NY	Multi-Owned	Mills Mills 172	1995	0.22
NY	Alamy Engineering Corporation	Stuyvesant Falls	1999	2.8	NY	Alamy Engineering Corporation	Stuyvesant Falls	1999	2.8
NY	Multi-Owned	Mount Morris 160	2000	0.3	NY	Multi-Owned	Mount Morris 160	2000	0.3
NY	Alamy Engineering Corporation	Malheurville	2000	4.2	NY	Alamy Engineering Corporation	Malheurville	2000	4.2
NY	Multi-Owned	Ward	2000	2	NY	Multi-Owned	Ward	2000	2
NY	Alliance Energy Renewables, LLC	Saugerties Bridge 1	2007	3	NY	Alliance Energy Renewables, LLC	Saugerties Bridge 1	2007	3
NY	New York Power Authority	Kenosca	2012	2	NY	New York Power Authority	Kenosca	2012	2
OR	Portland General Electric Company	Bull Run Hydro	2008	20.8	OR	Portland General Electric Company	Bull Run Hydro	2008	20.8
OR	Multi-Owned	Powerdale	2010	6	OR	Multi-Owned	Powerdale	2010	6
OR	Multi-Owned	Cline Falls	2010	1	OR	Multi-Owned	Cline Falls	2010	1
PA	River Bounty Inc	Oakland Dam Hydroelectric	2013	1.5	PA	River Bounty Inc	Oakland Dam Hydroelectric	2013	1.5
RI	Providence City of (RI)	Providence	2008	1.5	RI	Providence City of (RI)	Providence	2008	1.5
TX	Denton City of	Ray Roberts	2007	1.2	TX	Denton City of	Ray Roberts	2007	1.2
TX	Small Hydro of Texas, Inc.	Small Hydro of Texas	2008	1.5	TX	Small Hydro of Texas, Inc.	Small Hydro of Texas	2008	1.5
TX	Bratisle River Authority	Morro Shoppet	2014	20.6	TX	Bratisle River Authority	Morro Shoppet	2014	20.6
UT	Moan Lake Water Users Assn	Big Sandwash Reservoir	1999	1.8	UT	Moan Lake Water Users Assn	Big Sandwash Reservoir	1999	1.8
UT	Multi-Owned	American Fork	2007	0.66	UT	Multi-Owned	American Fork	2007	0.66
VA	Puget Sound Energy, Inc	Nasawake	1999	1.5	VA	Puget Sound Energy, Inc	Nasawake	1999	1.5
VA	Multi-Owned	Naches	2003	6.3	VA	Multi-Owned	Naches	2003	6.3
VA	Multi-Owned	Naches Drop	2003	1.4	VA	Multi-Owned	Naches Drop	2003	1.4
VA	Puget Sound Energy, Inc.	White River	2004	70	VA	Puget Sound Energy, Inc.	White River	2004	70
VA	Multi-Owned	Combs	2011	13.7	VA	Multi-Owned	Combs	2011	13.7
VA	DukePower America Co Ltd	DukePower America Elwha	2011	14.8	VA	DukePower America Co Ltd	DukePower America Elwha	2011	14.8
VA	DukePower America Co Ltd	DukePower America Glina	2011	14.3	VA	DukePower America Co Ltd	DukePower America Glina	2011	14.3
VA	Multi-Owned	Shenandoah	1998	0.6	VA	Multi-Owned	Shenandoah	1998	0.6
VA	North American Hydro, Inc.	Blackhawk Hydro	1998	0.48	VA	North American Hydro, Inc.	Blackhawk Hydro	1998	0.48
VA	North Central Power Co., Inc.	Blackhawk Hydro	2008	6.3	VA	North Central Power Co., Inc.	Blackhawk Hydro	2008	6.3
VA	Kaukauna City of	Old Badger	2012	2	VA	Kaukauna City of	Old Badger	2012	2

SOURCE: SML Data / S&P Global Market Intelligence

