

Nevada City 100% Renewable Energy Plan (REP)

Authors: Nevada City 100% Renewables Committee - Charter Sep 18, 2017

On August 9, 2017 the Nevada City Council adopted this resolution:

A RESOLUTION OF THE NEVADA CITY COUNCIL ESTABLISHING A GOAL OF 100% RENEWABLE ENERGY FOR NEVADA CITY:

Renewable Energy Goals:

- 1) 100% Renewable Electricity by 2030 - Implement the City's Energy Action Plan for electricity efficiency to reduce its use 28% by 2020. Ensure the transition to 100% renewable energy for its community electricity supply from PG&E and independent providers by 2030.
- 2) 100% Renewable Energy by 2050 - Phase-out fossil fuels in all sectors including electrification of transportation and heating systems. Support Federal and State programs for major investments in clean and renewable energy, storage and grid infrastructure to ensure reliability and affordability.
- 3) Progress on these transitions will be published at least every other year starting in 2018.

This 2017 Resolution follows on from the 2015 Nevada City Energy Action Plan, which is a roadmap for expanding energy-efficiency and renewable-energy efforts (see Appendix D).

The Nevada City 100% Renewable Energy Plan (REP) goal is to continue implementing the goals, strategies and actions of the EAP and adding new actions to reach the particular goals of the REP. By July, 2020 we hope to have the energy figures from PG&E for 2019 to not only judge how the goals of the EAP were met, but also to establish a baseline for the year 2020.

Table 1 - Energy Goals

Energy Use	2020 EAP Projection	2020 Actual	2030 REP Projection	2030 Cal/IOU Projection	2050 REP Projection	2045 Cal. Projection
Electricity	27,911,082 kWh		100% Renewable Electricity	60% Renewable Electricity	100% Renewable Energy	Carbon neutral
Natural gas	1,575,460 therms		20% reduced use from 2020	No target	No natural gas	Carbon neutral

Table 2 - Energy projections

Electricity kwh	Current Usage	2035 BAU	2035 Savings	2035 usage	2035 PG&E 75% renewable	2035 non-renewable
Nevada City	27,911,082	33,670,454	12,121,363	21,549,091	16,161,818	5,387,273

Gas - Therms	Current Usage	2035 BAU	2035 Savings	2035 usage	2035 PG&E kWh 75% renewable	2035 kWh non-renewable
Nevada City	1,575,460	1,736,172	503,489	1,232,683	27,088,209	9,029,403

It should be noted that residential and commercial carbon emissions are 12% of California emissions (Transportation 41%, Industrial 24%, AG 8%, Other 15%).

Reaching the Resolution's 100% renewable electricity goal by 2030

Currently Nevada City obtains most of its electricity (90%) from PG&E. SB100 requires that all utilities must provide 60% renewable electricity of retail sales by 2030. That means that Nevada City cannot be 100% zero carbon unless it finds another source that is 100% renewable. The City can be carbon neutral if the 40% of their non-renewable supply is offset by renewable generation from another source, such as a solar farm.

Note: solar panels are an intermittent source, so net metering allows them to be carbon neutral, but not zero carbon.

Assuming PG&E continues to be the electricity source, the first step is to reduce total electricity used so less has to be offset. Building retrofitting such as improved insulation, triple-paned windows, LED lighting along with more efficient appliances are important considerations. The Nevada City EAP used a 30% building participation with 30% efficiency improvement that would save 3 million kWh. We can make the assumption that over the next 10 years another 30% do home-retrofitting.

The EAP projected that 579 residential buildings (40%) and 152 non-residential buildings (20%) would install solar from 2014 to 2020 saving 6.3 million kWh. We will assume that by 2030 another 40% residential and 20% non-residential would participate and provide another 6.3 million kWhs of savings (we will verify with the County how many participated for the last seven years), though there may be less participation.

If we assume that the 2019 Title 24 Zero Net Energy standards will be applied to all new residential buildings, these buildings will be zero carbon for electricity if solar provides all electricity, but only carbon neutral if the building is shaded or because of natural gas use. We can also assume that few new non-residential buildings will be built due to architectural standards for Nevada City. If they are built, they are not required to be zero carbon or carbon neutral until 2030 when the new regulation becomes effective,

Starting with 27,911,082 kWh projected for 2020 and subtracting 3 million kWh efficiency savings and 6 million solar savings, that would leave approximately 19 million kWh to be provided by PG&E in 2030. If the city and its residents remain with PG&E, that means they will have to find a way to offset the other 40% non-renewable electricity or 7.6 million kWh to be carbon neutral.

Nevada City has prepared an RFP for building of a solar farm at the old city airport. The recommended size is 4.39 MW-DC or 3.84 MW-AC producing 7,288,404 kWh/year. This essentially would create a carbon offset to the non-renewable portion of PG&E electricity. Technically the renewable energy credit (REC) would go to whomever purchase the power and where it was used, but it could be said that the City had provided the renewable power to meet its resolution goal.

An alternative would be to obtain power from a source other than PG&E. This could be from an existing CCA that has goals of obtaining 100% renewable energy by 2030, or forming a CCA with NID to use its hydropower assets to meet the renewable goals.

Nevada City 2030 Planning Goals

The following planning administrative guidelines can help Nevada City to meet this resolution's 2030 goals:

1. Priority to be given to the lowest cost measures to meet energy needs including efficiency, weatherization, cogeneration, district heating and cooling, decentralized electricity generation and smart grids/microgrids, the use of industrial waste heat, building controls, automated lighting, solar-powered hot water heaters and programs that create an energy-saving culture in Nevada City.
2. Implementation of the 2019 Title 24 CA Building Standards that will require new construction to be Zero Net Energy (ZNE). The Title 24 energy standards will require new residential construction to meet 100% of the energy use by renewables starting in 2020. New commercial construction will need to comply by 2030.
3. Structured mechanisms to be created to include low-income citizens in the benefits to be derived including creating quality careers adhering to local source hiring, a just transition for workers displaced by fossil fuel reduction, equitable access through ownership and benefits to new opportunity for historically marginalized communities, and affordable clean energy options.
4. The public to have opportunities and be encouraged to participate in the process for planning and implementation.
5. The City to participate in related regulatory proceedings and State legislation to advocate for rules and policies that support the city's energy goals
6. The City to work with PG&E and independent providers to accelerate the transition to renewable energy and minimize dependence on fossil fuels, including but not limited to, participating in regulatory proceedings to express City preferences for renewable energy goals and opposition to any new fossil fuel uses
7. The City to seek to collaborate with surrounding communities and communities within PG&E and independent providers service territories to share best practices on planning and implementation and seek partnerships where beneficial for the parties
8. The City Council to have a plan to achieve these goals that will include interim milestones, budget estimates, equity metrics, estimated financial impacts, financing mechanisms, and the percentage of clean energy that shall be generated locally
9. Nevada City to make funds available for third-party expertise required to facilitate the Renewable Energy Plan for the city to achieve goals of 100% renewable energy
10. Nevada City to request additional funds in subsequent fiscal year budgets to be used solely for purposes of this resolution.

The following additional actions are recommended (see appendices A and B for other conclusions):

- 1) Keep abreast of new technologies and grant opportunities and hold public meetings to release the information
- 2) Hold regular forums to explain various incentive plans and grant opportunities

- 3) Nevada City to work with PG&E to see that all PG&E electricity for Nevada City comes from renewable energy. Independent providers should be used to supply renewable electricity for that portion of electricity from PG&E not from renewable energy. Community Choice Aggregations are a possible alternative.
- 4) Install solar facilities or contract for a solar farm to ensure that all City facilities run on 100% renewable energy, and offset City citizen uses.
- 5) All new homes to be all-electric (New all-electric homes are being built in the Sacramento area currently).
- 6) Ensure that building decarbonization rules based on AB3232, SB49, and Sb1477 be recommended, including retrofitting existing homes to all electricity.

2050 Goal of 100% Renewable Energy

To meet the 2050 goals of the resolution, the following additional actions are recommended, that can be implemented as soon as possible:

- 1) The only energy source in use is electricity created by renewable energy sources of hydropower, solar power, wind power or biomass. This will require the electrification of all existing and future homes by conversion of natural gas systems to electric:
 - a. Home heating and ranges
 - b. Commercial/municipal heating
 - c. Hot water systems
- 2) This goal also requires that the transportation and agricultural sectors convert to electric vehicles from gas combustion vehicles.
- 3) Planting trees, implementing regenerative AG, reducing vehicle use, reducing food waste, reducing water use and other measures to reduce the individual carbon footprint.
- 4) These conversion efforts will need to be financed/supported by Federal and State subsidies

Appendix A contains a current EAP savings table for kWh and recommended actions.

Appendix B contains a current EAP savings table for therms and recommended actions.

Appendix C contains definitions relating to renewable and clean energy.

Appendix D contains recommended actions for the current EAP

Appendix E contains recommended actions for the County and Grass Valley EAPs.

Appendix F contains recent California Regulatory Context

Appendix A

Nevada City EAP kWh Emissions Savings Analysis - 2020 savings 10,794,804 kWh

28% reduction in electricity use

Category	Residential	Non-Residential	City	Total
Building efficiency	822,141	2,240,443	76,513	3,139,097
Title 24 compliance	111,684	694,696		806,380
Exceed Title 24	25,788	44,902		70,690
New bldg 70% renew	60,171	209,541		269,712
Solar	4,220,706	2,122,544		6,343,250
Reduce potable	5,754	5,754	144,239	155,747
Reduce landscaping	4,964	4,964		9,928
Total	5,251,208	5,322,844	220,752	10,794,804
Percent of total	48.6%	49.3%	2.1%	100.0%

Assumptions are:

- 30% of residences (out of 1,447) and 30% of non-residences will participate in energy efficiency programs.
- Nevada City municipality will reduce its electrical usage by 20%
- 569 residences and 162 non-residences will add solar produced electricity
- 100% of users will reduce potable and wastewater usage by 20%
- 15% of new construction will meet 70% of energy needs with renewable energy

Conclusions

- With 64% of the energy efficiency coming from non-residential, a good effort should be made to advise Nevada City businesses.
- With 75% of the Title 24 savings coming from non-residential, reaching out to them would be recommended.
- With 80% of the solar savings coming from residential housing, a major effort has to be educating and assisting existing homeowners on solar power.
- A strict enforcement of new construction zero net energy by the city is needed, so that new construction truly does not add to electricity load.

Appendix B

Nevada City EAP GHG Emissions Savings Analysis - 2020 savings 182,480 therms
10% reduction in natural gas use

Category	Residential	Non-Residential	City	Total
Building efficiency	75,211	60,779	5,366	141,356
Title 24 compliance	7,050	18,103		25,153
Exceed Title 24	2,502	1,235		3,737
New bldg 70% renew	5,837	5,763		11,600
Reduce potable			634	634
Total	90,600	85,880	6,000	182,480
Percent of total	49.6%	47.1%	3.3%	100.0%

Assumptions are:

- 30% of residences (out of 1,447) and 30% of non-residences will participate in energy efficiency programs.
- Nevada City will reduce its natural gas usage by 20%
- Nevada City will reduce potable and wastewater thermal usage by 20%
- 15% of new construction will meet 70% of energy needs with renewable energy
- A therm equals 29.3 kWh, so the natural gas savings is equal to 5,346,664 kWh

Conclusions

- Equal effort should be carried out for residential and non-residential building owners.
- A strict enforcement of new construction zero net energy by the city is needed, so that new construction truly does not add to thermal load.

Appendix C

Energy Planning Definitions

The goal is to stop using non-renewable sources of carbon for non-essential energy needed to run the current society. There are ways to express this:

- 1) Carbon neutrality - Achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset, or buying enough carbon credits to make up the difference. California sets 2045 as the goal for carbon neutrality and net negative thereafter.
- 2) Zero Net Energy (ZNE) - Same as carbon neutrality but applied to buildings. For example, a building with solar panels that sends renewable energy to the grid that is equal to the energy it uses from the grid can be considered “net zero” energy or carbon neutral.
- 3) Zero Carbon: This is a case when no carbon is emitted, so no carbon needs to be captured or offset. For example, a household or commercial building that is off-grid, running entirely on solar, and using zero fossil fuels can label its energy zero carbon.
- 4) Negative emissions - Refers to a number of technologies, the objective of which is the large-scale removal of carbon dioxide from the atmosphere.
- 5) 100% Clean, Renewable Energy - The source of energy is from renewable resources that include solar, wind, geothermal, hydro and biomass. To guarantee 100 percent emissions reductions from renewable energy, power consumption needs to be matched with renewable generation on an hourly basis. For intermittent wind and solar, it means use of storage of previously generated renewable energy. Clean energy is energy that is produced through means that do not pollute the atmosphere.

Appendix D

Nevada City Energy Action Plan (EAP) - Existing

The Nevada City Energy Action Plan (EAP) was approved by the City Council May 13, 2015. The document focuses on three energy use sectors within the community – residential, non-residential and municipal (which is a subset of non-residential). The two primary energy sources consumed by the three community sectors are electricity and natural gas which is distributed by Pacific Gas and Electric Company (PG&E). Direct sources account for around 10% of the PG&E uses. The report only evaluates energy consumed by buildings and municipal operations; other energy consuming sectors such as transportation, solid waste, etc. are not addressed but could be at a future date.

The Plan determined a 2005 baseline of kilowatt hours and therms, and then projects the savings by 2020 from various strategies and actions. It does, however, not relate these savings to GHG emissions or indicate the remaining GHG emissions or the percent of renewable electricity that has been obtained.

The goals address five key areas:

- Energy efficiency in existing structures
- Energy performance in new construction
- Expansion of renewable energy options
- Energy efficiency in municipal operations
- Water conservation which reduces energy needed to transport and treat water

The strategies focus on voluntary measures that can be taken by residents, businesses and the local government. Key components include developing and disseminating information on existing rebate and incentive programs; public outreach via the City's website and printed materials; training for staff, contractors and developers; and partnerships with PG&E and local and regional organizations. Energy reduction performance indicators and targets are established for each group of strategies. If all the actions are implemented, the EAP would reduce electrical energy used in 2020 by 28% and natural gas use by 10%.

The following are the goals and strategies for the Nevada City current EAP:

GOAL 1: INCREASE ENERGY EFFICIENCY IN EXISTING STRUCTURES

- **Strategy 1.1:** Expand outreach and education to increase participation in voluntary home energy-efficiency programs.
- **Strategy 1.2:** Expand outreach and education to increase participation in voluntary non-residential energy-efficiency programs.
- **Strategy 1.3:** Identify and promote programs that help finance energy-efficiency and renewable-energy projects.

GOAL 2: INCREASE THE ENERGY PERFORMANCE OF NEW CONSTRUCTION

- **Strategy 2.1:** Improve compliance with Title 24 Green Building and Energy Efficiency Standards.

- **Strategy 2.2:** Provide incentives for buildings to exceed the current Title-24 Energy Efficiency Standards.
- **Strategy 2.3:** Reduce the heat island effect and related summer heat gain in residential and non-residential projects.

GOAL 3: INCREASE RENEWABLE ENERGY USE

- **Strategy 3.1:** Evaluate the City’s residential, non-residential and municipal solar potential and assess barriers to increased solar energy use.
- **Strategy 3.2:** Develop a comprehensive renewable energy program that provides outreach, financing, and technical assistance.
- **Strategy 3.3:** Encourage new development projects to meet 70% of their energy needs from renewable resources.

GOAL 4: INCREASE ENERGY EFFICIENCY IN MUNICIPAL STRUCTURES AND OPERATIONS

- **Strategy 4.1:** Improve the energy efficiency of existing municipal structures.
- **Strategy 4.2:** Evaluate the feasibility of improving the energy efficiency of public lighting.
- **Strategy 4.3:** Evaluate the feasibility of improving the energy efficiency of the potable water and wastewater infrastructure.

GOAL 5: INCREASE COMMUNITY WATER CONSERVATION AND EFFICIENCY TO REDUCE ASSOCIATED ENERGY USE

- **Strategy 5.1:** Encourage residents and businesses to conserve water used indoors.
- **Strategy 5.2:** Encourage residents and businesses to conserve water used outdoors.

These goals and strategies can be continued to help meet the 100% resolution.

Replacement goal: Strategy 3.3: Encourage new development projects to meet 100% of their electricity needs by 2030 from renewable resources.

Nevada City EAP Actions

2015

- Partner with PG&E and regional organizations to activate existing energy efficiency and water efficiency programs
- Provide information on and opportunities for staff, contractors and developers to attend training on Title 24
- Develop solar roadmap to analyze solar potential, review barriers to solar and streamline permitting
- Adopt purchasing guidelines, benchmark municipal facilities and require energy efficiency analysis in all potable water and wastewater projects.

2016

- Update the City’s website with information and links to energy efficiency programs, case studies, financing programs.
- Determine the feasibility of offering incentives for new construction that completes a green building checklist, including:
 - ✓ Exceed Title 24 energy requirements

- ✓ Meet 70% of energy needs with on-site renewable energy
- ✓ Exceed water efficiency requirements
- Develop and adopt ordinance that explicitly permits greywater (recycled) systems
- Partner with PG&E, Nevada County and local banks to promote and expand financing options for energy-efficiency, renewable-energy and water-efficiency projects

2017

- Develop heat gain mitigation guidelines and ordinances for streets and parking lots
- Conduct energy audits, retro-commissioning on municipal facilities. Implement cost-effective energy efficiency projects and leak detection
- Evaluate the cost-effectiveness of upgrading traffic signals and street lights to LED
- Work with NID to redesign the water bills to promote conservation, develop new water-efficiency programs and market programs in Nevada City including design of a zero-water demonstration garden

Appendix E

Grass Valley and Nevada County EAP Actions

2019

- Continue to promote existing energy-efficiency, water-efficiency, and renewable-energy programs and best practices by providing information when available at City offices and on the City website. (1.1, 3.1, 2.2)
- Develop a public recognition system for businesses that audit and retrofit their facilities and business practices. (1.1)
- Join the Institute for Local Government's Beacon Program in order to receive assistance in tracking community and municipal energy use and learn more about best practices. (1.1, 1.3)
- Continue to provide information regarding no-cost Title 24, Part 6 trainings for plans examiners, building inspectors, architects, designers, and contractors at City offices and on the City website. (1.2)
- Continue to conduct building audits to benchmark energy and water use in facilities, and identify cost-effective retrofit projects. (1.3, 3.1)

2020

- Provide available information on incentives, resources, trainings, and funding opportunities for achieving Title 24 ZNE goals. Encourage new construction and renovation projects to participate in Energy Efficiency and Zero Net Energy design programs. (1.2)
- Provide heat gain mitigation information when available for streets and parking lots (i.e. light-colored building and paving materials, landscaping, green roofs, shade trees, and other green infrastructure). (1.1)
- Retro-commission facilities to maximize energy performance and complete cost-effective retrofit projects. (1.3)
- Provide information when it becomes available on the benefits of incorporating renewable energy and energy storage systems into retrofit projects and into new construction. (2.1, 2.2, 2.3)

2021

- Consider adopting purchasing guidelines and energy-efficiency analysis requirements in RFPs. (1.3)
- Continue expanding on-site renewable energy at feasible City facilities and sites. Further renewable energy procurement efforts by evaluating additional sites for renewable energy on City facilities and property. (2.2)
- Encourage and participate in bulk purchasing of energy storage systems to support grid reliability and community resilience. (2.3)
- Encourage broadband infrastructure in new development proposals to ensure optimal connectivity for IT controls and networks of operating systems. (2.3)

Appendix F

State of California Regulatory Context

- **Title 24, Part 6.** Energy Efficiency Standards first adopted in 1978. Ongoing updates. Established minimum energy efficiency performance standards for residential and non-residential buildings. Effective January 1, 2020 new energy efficiency standards will require near zero net energy for residential cost-effectively through efficiency and onsite renewable energy.
- **Executive Order S-3-05.** Governor's Executive Order. Set GHG reduction targets for state agencies at Year 2000 levels by 2010, 1990 levels by 2020 and 80% below 1990 levels by 2050.
- **Assembly Bill 32.** Landmark legislation that requires the California Air Resources Board (ARB) to develop regulatory and market mechanisms that will reduce greenhouse gas emissions to 1990 levels by 2020.
- **Senate Bill 97.** Requires lead agencies to analyze GHG emissions and climate change impacts under the California Environmental Quality Act.
- **CALGreen.** Enhances sustainable construction practices through mandatory and voluntary measures including reduced construction waste, water conservation, non-toxic sealants and use of renewable materials. Now part of Title 24 and updated on same schedule.
- **Senate Bill 32.** Expands upon AB 32 and requires the California ARB to develop regulatory and market mechanisms that will ensure that statewide greenhouse gas emissions are reduced to 40% below 1990 levels by 2030.
- **Assembly Bill 398.** Extends the cap-and-trade program mandated by AB 32 to continue through 2030.
- **Senate Bill 100.** Revised the Renewable Portfolio Standards to require achievement of 50% renewable resources target by 2026, 60 percent by 2030 and 100% eligible renewable energy or zero-carbon resources by 2045.
- **Assembly Bill AB3232 (9/13/18)** Assess the potential for the state to reduce the emissions of greenhouse gases in the state's residential and commercial building stock by at least 40 percent below 1990 levels by January 1, 2030. Assess the cost-effectiveness of strategies to reduce emissions of greenhouse gases from space heating and water heating in both new and existing residential and commercial buildings.
- **Senate Bill 49 (10/9/19)** Adopt, by regulation, and periodically update, standards for appliances to facilitate the deployment of flexible demand technologies that can more conveniently have their electrical demand controlled by load-management technology and third-party load-management programs.
- **SB1477 (11/18/18)** Building Initiative for Low-Emissions Development (BUILD) and Technology and Equipment for Clean Heating (TECH). There are a range of technologies that can achieve deep emissions reductions in buildings, including advanced energy efficiency technologies, clean heating technologies, energy storage, and load management strategies.