TID Integrated Resource Plan (IRP) 2019

Board Workshop
November 20, 2018
Approved by Governor on 10/7/15.

Some of the key elements:

- Required the California Energy Commission (CEC) to establish statewide targets to double energy efficiency savings achievement.
- Increased RPS targets to 50% by 2030.
- Required IOUs, Electric Service Providers, Community Choice Aggregators, and POUs with an annual electrical demand exceeding 700 GWh (as determined on a three-year average commencing January 1, 2013)
  - Adopt Integrated Resource Plans (IRP) that meet certain requirements and schedule/process to update IRPs.
    - For POUs updates has to be at least every 5 years.
    - For POUs first IRP must be adopted by 1/1/19.
  - POUs must submit IRPs for review to the CEC by 4/30/19.
  - CEC develop submittal guidelines to address IRP requirements.
  - Per CEC guidelines the IRP must cover the period 1/1/18 to 12/31/30.
  - ARB established GHG targets for each entity required to file and IRP.
IRP Requirements

- Meet GHG targets established by ARB (40% reduction from 1990 levels by 2030).
- Ensure procurement of at least 50% renewable by 2030.
- Just and reasonable rates.
- Minimize impacts on ratepayers.
- Ensure system and local reliability.
- Strengthen the diversity, sustainability, and resilience of the bulk transmission and distribution systems, and local communities.
- Enhance distribution systems and demand-side energy management.
- Minimize local air pollutants and GHG with early priority on disadvantage communities.
- Acquire all cost effective, reliable, and feasible energy efficiency first to serve load.
  - TID adopted EE goals.
- Study energy storage in IRP.
  - TID has done several energy storage studies and has made determination on adopting targets.
- Transportation electrification.
- Diversified portfolio consisting of both short-term and long-term electricity and demand response products.
- Meet planning and operating reserve requirements.
TID’s normal IRP objectives are consistent with SB350 requirements.
- Reliable and safe electricity service.
- Stable, just, reasonable, and affordable rates.
- Meet applicable TID, state, federal, Western Electricity Coordinating Council ("WECC"), and North American Electric Reliability Corporation ("NERC") policies, mandates, rules, and regulations.
- Maintain a diversified and flexible electric supply portfolio to minimize risk exposure while providing opportunities to capitalize on the changing electric industry landscape.
- Promote the standard of living within the service area by supporting the state’s climate goals.

Provides a snapshot of future needs and surplus and how they can be met at the least projected cost and acceptable risk.

Based on set of assumptions/information at the time of analysis, actual procurement may vary from plans.
Periodic updates to reflect latest assumptions, market conditions, and regulations.

- Load forecast updated annually.
- Renewable resource position updated several times per year and each time regulations change.
- GHG position updated monthly.
- Resource plan for the current and next year updated monthly.
- Resource plan for the next six years updated annually (supports the budget process).
- Updated on ad hoc basis as needed to analyze specific issues (i.e. proposed power plant upgrade, revised operating parameters).
Integrated Resource Plan (2)

- Load Forecast (inc. EE and DG effects)
- Generation, Transmission, and Contract Parameters
- Planning and Operating Reserve Requirements
- Generation, Power, Fuel, Transmission Prices
- Energy Efficiency Targets
- RPS Goals
- Distributed Gen (Net Metering) and Demand Response
- GHG Limits
- Energy Storage
- Electric Vehicles
- Disadvantaged Communities
- Power Supply Cost
- Capacity and Energy Deficits/Surplus
- Fuel Requirements
- Resource Portfolio Diversity
- Energy Efficiency Savings
- RPS Compliance (%, buckets, banked amounts)
- Integration Requirements
- GHG Compliance (Annual emissions, CCA balance)
- Disadvantage Community Impacts
The 2019 TID IRP was focused on addressing the requirements of SB350 and CEC IRP Guidelines.

Although the IRP provides a roadmap to the future, future actions may vary from the IRP due to changing assumptions, market conditions, and regulations.

- For example, expected decline in renewable tax credits and continued decline in solar and wind costs may make it advisable to procure additional renewable sooner than suggested by the IRP.
  - Wind PTC ($19/MWh for 2017)
    - Begin construction by 12/31/17 – credit is reduced by 20%
    - Begin construction by 12/31/18 – credit is reduced by 40%
    - Begin construction by 12/31/19 – credit is reduced by 60%
  - Solar ITC (currently 30% of capital cost)
    - Begin construction by 12/31/19 – 30%
    - Begin construction by 12/31/20 – 26%
    - Begin construction by 12/31/21 – 22%
    - Placed in service after 12/31/23 – 10%
  - Recent solar PPAs were reported in the low $20s/MWh.
CA Electric Utility Landscape

- **CALIFORNIA GREENHOUSE GAS EMISSIONS (MMTCO₂E)**
  - 2020 Target: 550 levels
  - 2030 Target: 42% below 1990 levels
  - 2050 Target: 60% below 1990 levels

- **Historical CARB Current Vintage CCA Auction Settlement and Auction Reserve Price**

- **Calendar Year**
  - **Annual Energy Efficiency Goals**
    - **MWh**
      - 2017: 16,394
      - 2018: 14,939
      - 2019: 15,001
      - 2020: 14,938
      - 2021: 14,172
      - 2022: 13,698
      - 2023: 12,530
      - 2024: 11,638
      - 2025: 11,023
      - 2026: 10,476
    - **MW**
      - 2017: 3.6
      - 2018: 3.6
      - 2019: 3.6
      - 2020: 3.5
      - 2021: 3.3
      - 2022: 3.2
      - 2023: 2.9
      - 2024: 2.7
      - 2025: 2.5
      - 2026: 2.4

**CA Title 24**
CA Electric Utility Landscape (2)

- Customer Solar Generation Capacity
- Typical Spring Day
- TWP Actual and Scheduled Generation
- Historical CAISO SP15 5-Min LMP

RPS/SB100

Negative Prices
CA Electric Utility Landscape (3)
Apple now globally powered by 100 percent renewable energy

Nine More Apple Suppliers Commit to 100 Percent Clean Energy Production
Energy and Demand Requirements

- Load Forecast – an econometric model used to forecast future # of customers, energy use and peak demand
- Key inputs include:
  1. Historical # of customers and energy use (by rate class).
  2. Historical load and coincidence factors.
  3. Historical system load data for last 20 years.
  4. Historical distribution losses for last 7 years.
  5. Historical temperature data (1950 to present).
  6. Historical & projected employment, income and population figures for Stanislaus County.
  7. Historical Consumer Price Index
  8. Historical delivered natural gas prices
  9. Projected California natural gas prices
  10. Historical customer solar installations, capacity and generation (by rate class).
  11. Customer solar growth forecast from EIA, CEC, IHS Markit
  12. Historical hourly customer solar profile (by rate class)
  13. Projected EE savings and demand reduction from Navigant’s ELRAM
  14. Projected # of electric vehicles and energy consumption from CEC calculator
  15. EV hourly generation profile from IHS Markit
Cumulative Energy Efficiency Savings

Projected Energy Efficiency savings (from EE Targets passed by TID Board March 7, 2017).

Year

MWh

2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

0 20,000 40,000 60,000 80,000 100,000 120,000 114,010
Electric Vehicle Forecast

Projected Electric Vehicle load and number of Electric Vehicles (from CEC calculator).
Customer Owned Generation Forecast

Customer-owned Distributed Generation forecast (from internal forecast using historical data and projected forecasts from multiple vendors). Includes Title 24 Solar PV requirements.
Electric Load Forecast

Year | MW | MWh
--- | --- | ---
2018 | 2,181,713 | 534
2019 | 2,215,683 | 538
2020 | 2,217,533 | 538
2021 | 2,220,166 | 538
2022 | 2,226,252 | 539
2023 | 2,234,397 | 539
2024 | 2,252,491 | 540
2025 | 2,256,227 | 541
2026 | 2,263,166 | 540
2027 | 2,271,184 | 541
2028 | 2,281,296 | 541
2029 | 2,291,304 | 541
2030 | 2,301,316 | 542
Growing customer solar changes TID’s hourly load profile

- Lower daytime net load in Spring, larger load ramps in morning and evening
- Peak hour in Summer shifted to later in the day
Load Ramps 2017 vs. 2030

Average 3 Hour Load Decrease 2017 vs 2030

Average 3 Hour Load Increase 2017 vs 2030
### TID Electric Resources

<table>
<thead>
<tr>
<th>Resource Name</th>
<th>Capacity (MW)</th>
<th>Ownership Type</th>
<th>Term</th>
<th>Fuel</th>
<th>Type</th>
<th>Inside TID</th>
<th>Renewable</th>
<th>GHG Free</th>
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</table>
TID BA Monthly Energy Balance

- Boardman
- TWP
- Other
- Renewable Purchases
- Purchases
- Walnut
- Almond
- Don Pedro
- WEC
- TID BA Load + Wholesale Sales
- TID BA Load

Month: Jan-18 to Jul-30
Units: MWh
Renewable Resource Balance

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<tr>
<th>Year</th>
<th>TWP</th>
<th>TID Sm Hydro</th>
<th>Other</th>
<th>Biomass</th>
<th>Banked Surplus</th>
<th>Unbundled RECs</th>
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<th>Other Sm Hydro</th>
<th>SunPower</th>
<th>Future Procurement</th>
<th>SB100 RPS Requirement - Base Load</th>
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</table>
Power Supply % of Retail Load

- Renewable %
- GHG free %
- Thermal %
- Purchases %
- Coal %
How Much, What, Where, When,

- Solar, Wind, Geothermal, Small Hydro.....
- TID, CAISO, NW, New Mexico, Wyoming .......
- 2024 and 2029 or sooner

To answer the questions above, the plan is to follow processes used in the past:
  - TID staff will monitor markets and RPS position and will recommend to the Board on timing and amount.
  - RFP to select the best resource available at such time.

- Preliminary analysis on CAISO vs TID and how Energy Storage can be used to optimize/integrate the renewable resource addition.
Energy Storage with CAISO Resource

- Co-locate energy storage with solar plant in CAISO to optimize against negative power prices.
- Co-locate energy storage with solar plant in TID BA to help balance the TID system and integrate the solar plant.
- Modeled a 4 hour duration lithium ion battery system.
~50% of the time the solar plant output will be 60% or greater than load for the hour.

~4% of the time the solar plant output will be greater than load for the hour.
Solar Plant in TID (2)

**Average 3 Hour Load Decrease 2017 vs 2030**

**Average 3 Hour Load Increase 2017 vs 2030**
Projected Energy Balance (March 16, 2030)
Load Ramps (before and after Energy Storage)

Average 3 Hour Load Decrease 2030 (with Energy Storage)

Average 3 Hour Load Increase 2030 (with Energy Storage)
Average Yearly Impact of Adding Energy Storage in TID's BA

<table>
<thead>
<tr>
<th>Category</th>
<th>Impact ($)</th>
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<td>Fixed Expense</td>
<td>$4,162</td>
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<tr>
<td>Energy Arbitrage</td>
<td>$(504)</td>
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<tr>
<td>Fuel Expense</td>
<td>$(440)</td>
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<tr>
<td>GHG Expense</td>
<td>$(1,501)</td>
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<tr>
<td>AS Sales</td>
<td>$(2,212)</td>
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<tr>
<td>Total</td>
<td>$(495)</td>
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Deployment of “smart meters” on all customers (expected completion in 2018) that will support load analysis, rate design, and demand side management programs.

TID has several ongoing successful Energy Efficiency programs for both residential and non-residential customers.
- Non-residential lighting program.
- Commercial Direct Install program.
- Home Energy Analysis program.

On January 1, 2019 TID will implement an Electric Vehicle program that will comprise of:
- Customer incentives.
- Community/government partnerships.
- TID fleet.
- TID employee charging policy.
- EV rate hearing in early 2019.

TID has planned T&D upgrades/additions to accommodate projected load growth.

**Disadvantaged Communities**
- Discounted Rates for Low Income
- Low Income Weatherization
- Higher EV rebates.
Purchased Power and Fuel Expense Forecast

Year | $ Mil
--- | ---
2018 | $82.0
2019 | $70.2
2020 | $75.2
2021 | $79.7
2022 | $80.2
2023 | $81.5
2024 | $86.0
2025 | $94.0
2026 | $101.2
2027 | $106.6
2028 | $111.5
2029 | $114.8
2030 | $121.0
IRP Conclusions

- Load is projected to grow about 0.4% per year during the 2018-2030 (“Planning Period”).
- Customer distributed generation continues to grow from 35 MW to 87 MW by 2030 affecting the load shape.
- EVs will reach over 6,600 vehicles in 2030 representing ~1% of load.
- Existing generation and transmission resources will be sufficient to meet energy, capacity, reserve requirements.
- New renewable resources will be needed by 2025 to comply with SB100 and the GHG targets.
- Adding large scale intermittent renewable resources in TID’s system may require additional flexible resources like energy storage.
- TID should consider adding a small energy storage system in the near term.