Central Iowa Power Cooperative

2022 Integrated Resource Plan

For Submittal to WAPA

April 2022

Clearspring Energy Advisors LLC

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For Submittal to WAPA

Central Iowa Power Cooperative

Des Moines, Iowa

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CIPCO Member Systems

CIPCO's 12 member rural electric cooperatives are:

Clarke Electric Cooperative (IA-079)
Consumers Energy Cooperative (IA-007)
East-Central Iowa Electric Cooperative (IA-095)
Eastern Iowa Light & Power Cooperative (IA-009)
Farmers Electric Cooperative (IA-073) +
Guthrie County Rural Electric Cooperative (IA-021)
Linn County Rural Electric Cooperative (IA-053)
Maquoketa Valley Electric Cooperative (IA-034)
Midland Power Cooperative (IA-093; IA-43 Greene)
Pella Cooperative Electric Association (IA-040)
Southwest Iowa Rural Electric Cooperative (IA-100)**
T.I.P. Rural Electric Cooperative (IA-056)

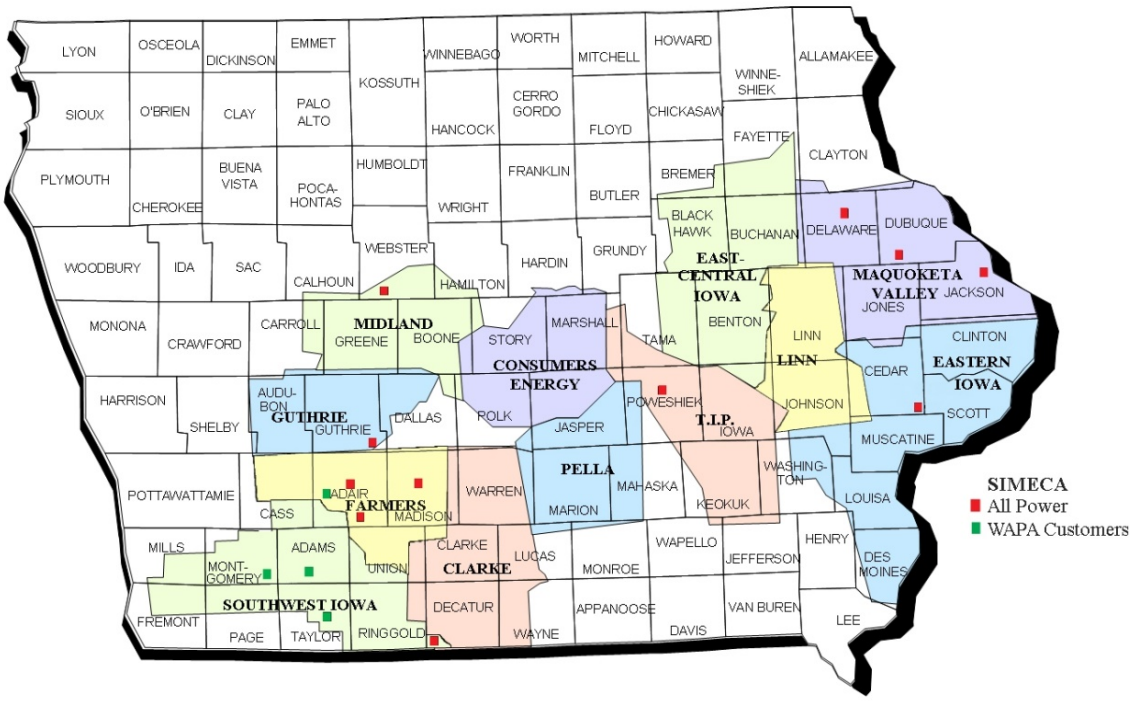
The South Iowa Municipal Electric Cooperative Association (SIMECA) is a federation of municipal utilities and a CIPCO member system. SIMECA's 15 municipal member systems are:

Bellevue	Corning*	Fontanelle* +	Lamoni	Stuart
Brooklyn	Durant	Gowrie	Lenox*	Villisca*
Cascade	Earlville	Greenfield +	Orient	Winterset

* A "wheeled" SIMECA member also receiving power from WAPA

** Southwest Iowa REC provides power to the City of Stanton beyond its WAPA allocation

+ Purchases a portion of their power through separate wind contracts



Executive Summary

The Central Iowa Power Cooperative (CIPCO) 2022 Integrated Resource Plan (IRP) is being submitted to the Western Area Power Administration (WAPA) in accordance with the requirements of the Energy Policy Act of 1992. The IRP is designed to evaluate CIPCO's future resource needs and to comprehensively and consistently determine the preferred mix of demand-side and supply-side resources to meet its system needs over the 2022 to 2036 period. The IRP objectives, process, methodologies, and results are documented in this report.

CIPCO's IRP provides a strategic roadmap to guide its ongoing resource and management decisions over a long-term planning horizon while maintaining the flexibility to adapt to ever-changing business, operational, and regulatory environments. The IRP strategy balances multiple objectives reflecting CIPCO's responsibilities to maintain competitive costs, optimize its use of resources, acquire new resources to meet future needs, maintain environmental responsibility, serve members' needs, and manage an array of potential risks. While the preferred resource strategy included in this IRP is intended to meet those objectives, it is recognized that the future may develop differently than is currently envisioned and will require adaptation within CIPCO's ongoing planning processes. This IRP's preferred plan portrays CIPCO's preferred resource strategy while incorporating flexibility and risk management to allow it to successfully meet the IRP's key objectives under a range of uncertain future outcomes.

CIPCO's member systems provide power to consumers located in 58 of Iowa's 99 counties in an area stretching 300 miles diagonally from northeast to southwest Iowa. The service territory borders the Mississippi River on the east and extends westward nearly to the Nebraska border. The southern portion of the service territory borders Missouri and extends northward to Dubuque and near Waterloo. CIPCO's member systems serve suburban areas adjacent to Iowa's largest cities including Ames, Des Moines, Cedar Rapids, Waterloo, Iowa City, Muscatine, Davenport, and Dubuque.

CIPCO's existing resources include a robust set of Demand-Side Management (DSM) programs, numerous and diverse power supply resources, and a transmission system designed to reliably deliver power to end-use consumers. The distribution systems and a modest amount of consumer-owned generation contribute to the integrated system's available resources.

A key component of the CIPCO system's resource strategy is its robust set of programs that promote energy efficiency, encourage conservation, and reduce annual peak demand. CIPCO and its member systems offer a variety of cost-effective DSM programs to residential, commercial, industrial, and agricultural consumers. These programs are evaluated and adapted, as needed, in response to changes in technologies, regulations, customer acceptance, or market conditions. In addition, voluntary interruptible contracts are available to medium- and large-sized businesses. The combination of these programs helps reduce the total energy use of end-use consumers, reduces the system's load during times of peak demand or emergency situations, and provides load flexibility to enhance reliability and reduce costs.

CIPCO's power supply resources include ownership of part or all of eight generation units at three stations, long-term power purchase agreements with wind, hydro, solar, and landfill gas (LFG) energy suppliers, generation resources owned by municipal electric utilities within the CIPCO system, short-term power supply contracts with third parties, and purchases from the wholesale market coordinated by the Midcontinent Independent System Operator (MISO).

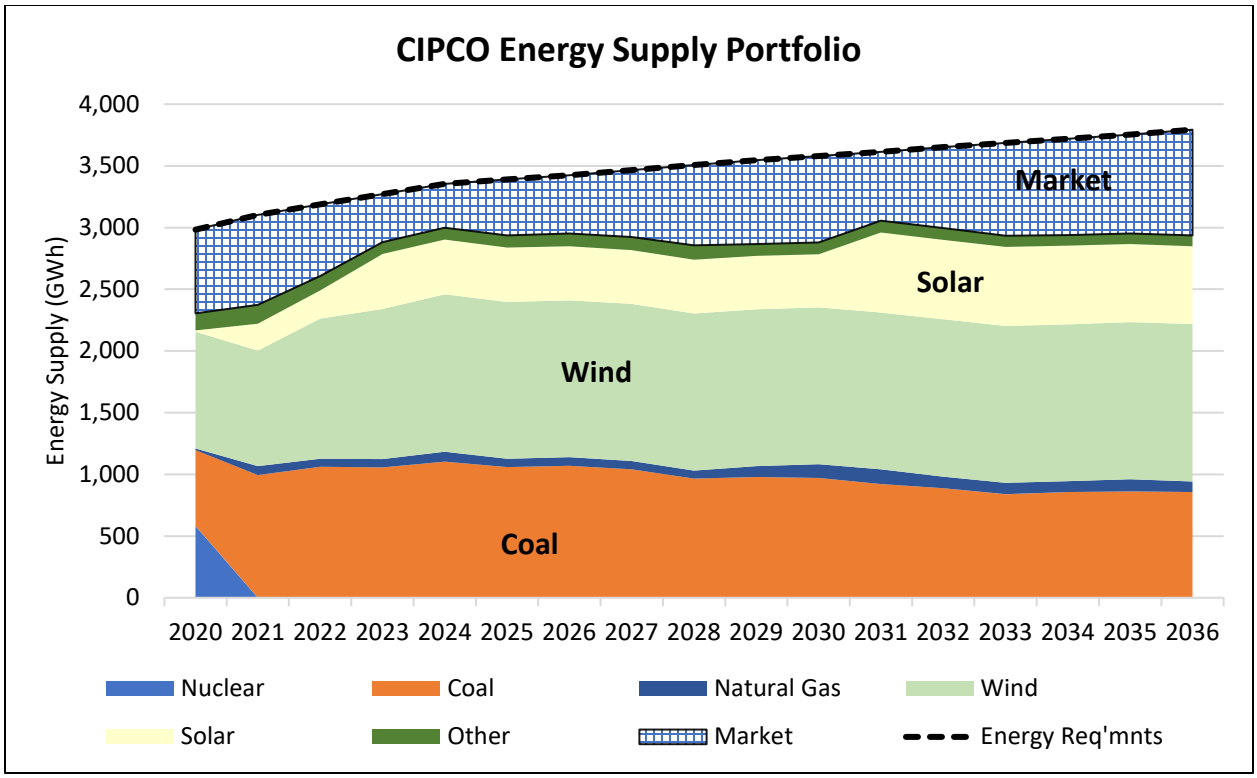
CIPCO's transmission resources include over 1,900 miles of transmission and sub-transmission lines including 1,504 miles of lines 69 kV and above, and 407 miles of sub-transmission 34 kV lines. Power is delivered to end-use consumers through over 300 distribution points and an integrated transmission network shared with Alliant Energy/Interstate Power & Light (IPL) which is owned and operated by ITC Midwest.

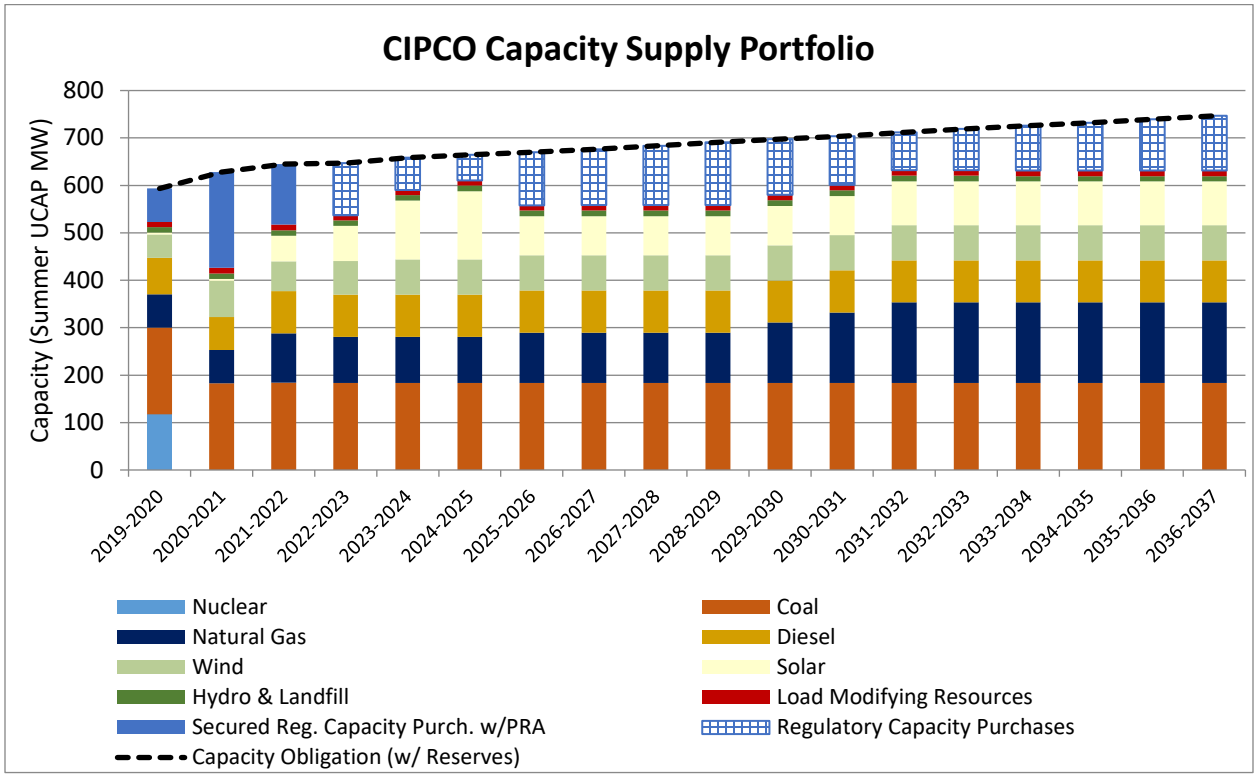
Future power supply resource needs are determined by load growth beyond what is met with cost-effective DSM and changes to existing power supply resources. Load growth on the CIPCO system is expected to occur at an average annual rate of 1.3 percent over the IRP planning horizon, including the impacts of CIPCO's DSM resources and customer-owned solar systems. In addition to load growth, it is possible that selected existing generation units may be retired over the IRP horizon or that selected long-term power purchase contracts will not be renewed. The IRP process evaluates available demand and supply-side resources on an integrated and consistent basis to determine the preferred resource mix to meet the CIPCO system's future power supply needs.

Based on the IRP analyses, CIPCO's future system needs will be met primarily with the following preferred set of resources:

- Over 30 DSM measures offered to residential, commercial, industrial, and agricultural consumers.
- Interruptible contracts for medium and large businesses. These contracts currently have the ability to provide approximately 10 MW of summer peak demand savings.
- Addition of a new 100 MW_{AC} solar generation long-term purchase contract originally scheduled to begin in late 2022 that was recently delayed into 2023.
- Additional long-term solar power generation beginning around 2030.
- Adding more small, natural gas-fired peaking generation units during the 2029 to 2032 period.

The following graphs illustrate CIPCO's future energy supply and capacity resources required to meet the needs of the CIPCO system beyond what is met through cost-effective DSM programs.


CIPCO Energy Supply Portfolio
Energy Supply (GWh)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Market
Solar
Wind
Coal
2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036
Nuclear
Coal
Natural Gas
Wind
Solar
Other
Market
Energy Req'mnts


CIPCO Capacity Supply Portfolio
Capacity (Summer UCAP MW)
800
700
600
500
400
300
200
100
0
2019-2020
2020-2021
2021-2022
2022-2023
2023-2024
2024-2025
2025-2026
2026-2027
2027-2028
2028-2029
2029-2030
2030-2031
2031-2032
2032-2033
2033-2034
2034-2035
2035-2036
2036-2037
Nuclear
Coal
Natural Gas
Diesel
Wind
Solar
Hydro & Landfill
Load Modifying Resources
Secured Reg. Capacity Purch. w/PRA
Regulatory Capacity Purchases
Capacity Obligation (w/ Reserves)

The preferred set of new resources meets CIPCO's future power supply needs in an adequate and reliable fashion while providing the following benefits:

- CIPCO's well-established DSM programs provide consumer benefits beyond energy savings including (but not limited to) increased home comfort, reduced use of water and other resources, increased home values, and increased environmental awareness.
- CIPCO's ongoing commitment to wind, hydro, solar, and biomass power helps mitigate risks from future fossil fuel price increases and environmental regulation.
- CIPCO's acquisitions of wind and solar power support job growth in rural Iowa and provide economic benefits to Iowa farmers, including consumers of its member-systems.
- CIPCO's planned investments in small gas-fired generation units will continue to diversify its fuel supply mix while providing local reliability and system support for intermittent generation resources.
- CIPCO's selected resource mix is consistent with its mission as a consumer-owned utility and the expressed preferences of its member-systems.
- The reduction in emissions intensity inherent in the preferred resource plan is in the public interest as it will provide benefits beyond the immediate CIPCO system.

The preferred resource mix identified in this IRP process helps CIPCO meet its key IRP objectives, including:

- Providing for the energy service needs of its members in a safe, reliable and economic manner;
- Reducing and managing adverse environmental effects;
- Maintaining a diverse and flexible set of resource commitments;
- Managing fuel price, wholesale market, and environmental risks;
- Providing documentation of CIPCO's IRP efforts for submittal to WAPA; and
- Ensuring that CIPCO's overall system cost remains within competitive boundaries.

This IRP is a collaborative effort involving input from CIPCO staff, its member system managers, Board of Directors representing its member systems, member-consumers of CIPCO's member systems, the general public, and third-party contributors. Collaboration among these parties has helped ensure that the preferred resource plan will be beneficial to CIPCO's member-systems and their member-consumers.

This report provides detailed descriptions of the IRP process, methodologies, analyses, and results.

Chapter 1: Background and Objectives

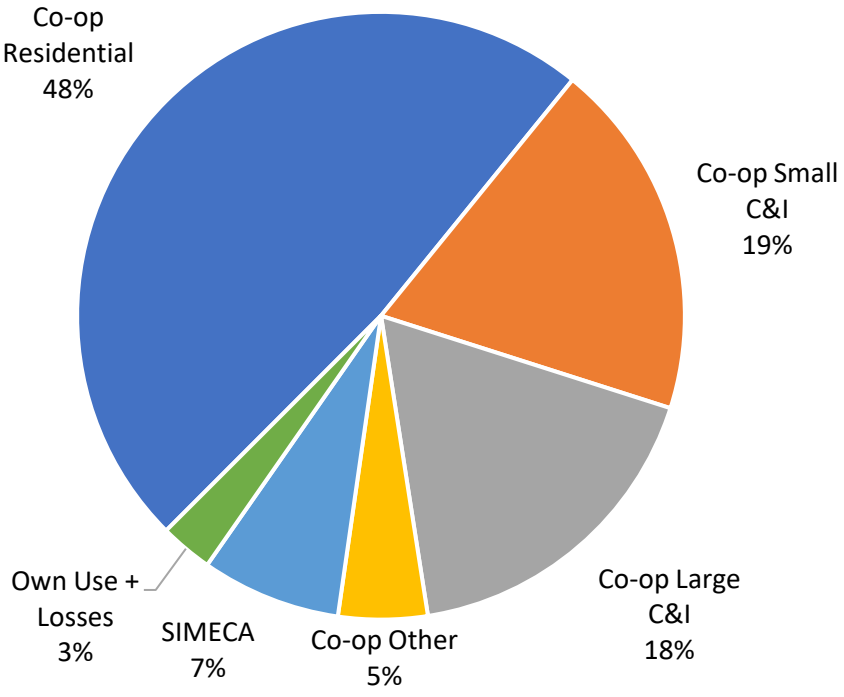
About CIPCO

Central Iowa Power Cooperative (CIPCO) is a generation and transmission cooperative, providing electric power and services to over 140,000 consumer-members through its 12 rural member cooperatives and a federation of 15 municipal utilities, the South Iowa Municipal Electric Cooperative Association (SIMECA). CIPCO's service territory stretches 300 miles diagonally across the state from Dubuque on the northeast to Shenandoah in the southwest, covering nearly one-half the land area of Iowa including suburban areas surrounding most of Iowa's largest cities. Its member systems serve a population of approximately 350,000 rural and urban residents and over 17,000 business accounts.

Although the consumer base of CIPCO's member systems was traditionally dominated by rural agricultural consumers, the member mix has become increasingly suburban due to development within commuting distance of Iowa's larger cities. The most recent CIPCO end-use survey indicates that only 18 percent of CIPCO's residential accounts now include a farm, a decline from over 50 percent in 1990.

The CIPCO system's 2020 total energy requirements were 2,983 GWh and its peak demand was 605 MW. Nearly one-half of CIPCO's 2020 energy requirements were retail sales to residential consumers of its 12 member rural distribution cooperatives, while over one-third were sales to commercial and industrial (C&I) consumers. Sales to SIMECA member systems comprised seven percent of total 2020 requirements. The composition of CIPCO's 2020 energy requirements is provided in Figure 1.

Figure 1 – CIPCO 2020 Energy Requirements



CIPCO provides power to its member systems through a resource base consisting of:

- CIPCO-owned generation resources
- Bulk power purchases and interchange market power
- Municipal member-owned generation
- Pooling of generation and transmission resources with Alliant/IPL and ITC Midwest
- Power purchase agreements (including renewable energy[1])
- Firm power from WAPA
- A portfolio of DSM programs

In addition, some member systems purchase wind power from third-party providers to meet a portion of their power requirements and some individual retail customers have on-site generation that supplies a portion of their energy needs.

CIPCO is financially sound and maintains an 'A' credit rating with Fitch Ratings with a stable outlook and an 'A' credit rating with Standards & Poor's with a stable outlook.

CIPCO IRP Objectives

The 2022 CIPCO Integrated Resource Plan (IRP) comprehensively evaluates CIPCO's current resource mix and its long-term resource needs and determines the appropriate future resource mix to meet the needs of its member systems in a safe, reliable, cost-effective, and environmentally-responsible manner. The IRP process, analyses, and report help guide CIPCO's long-term resource planning strategy and are designed to meet the requirements of WAPA. This IRP updates information and plans provided in CIPCO's 2017 IRP and previous IRPs that have been approved by WAPA.

The 2022 CIPCO IRP is being submitted to WAPA via Member-Based Association (MBA) status in accordance with the requirements of the Energy Policy Act of 1992 (EPAct), Public Law 102-486 Section 114, Title II – Integrated Resource Planning, and the Department of Energy, 10 CFR Part 905, Energy Planning and Management Program. This MBA filing represents the collective interests of the individual utilities served by CIPCO, including rural electric distribution cooperatives and municipal utilities served via SIMECA and other municipal electric utilities served directly by CIPCO's rural electric cooperatives.

As a consumer-owned, non-profit cooperative, CIPCO has always been committed to providing safe, reliable, and economical service to its membership. Integrated resource planning is a key process by which CIPCO accomplishes this goal on behalf of its member systems. Through its assessment of a broad range of available supply-side and demand-side resource options, the integrated resource planning process supports CIPCO's efforts to select the optimal mix of resources and programs to meet the needs of its membership.

[1] CIPCO invests in the development of renewable energy projects in several ways. It operates several small-scale solar arrays near communities it serves and retains the renewable energy credits associated with each. CIPCO also contracts with energy producers for the electricity output from wind, hydro, solar, and methane gas from a landfill (converted into electricity). CIPCO cannot claim these resources as "renewable" within its supply portfolio as it has either sold to third parties or does not receive the renewable attributes associated with the electricity produced from these sources in exchange for lowering wholesale prices to its member systems.

CIPCO has established the following objectives for the 2022 IRP:

- Provide for the members' energy service needs in a safe, reliable, and low-cost manner
- Reduce and manage adverse environmental effects
- Maintain diverse resource commitments that promote adequate flexibility to respond to uncertainties and changing market conditions
- Gain an understanding of, and experience with, new technologies to better serve and educate members as their wants and needs change
- Manage wholesale and retail market risks
- Retain balanced and diversified power supply and fuel portfolios
- Ensure that the overall system cost remains within competitive boundaries
- Provide clear and concise documentation of CIPCO's IRP efforts to WAPA

Organization of Report

The remainder of this report includes detailed discussions of the process and analysis completed as part of this IRP. The general outline of the remainder of this report, along with the WAPA requirements satisfied in each section (in accordance with WAPA's current IRP checklist), is provided as follows:

Ch. 2: Current Resources	IRP checklist: None
Ch. 3: Resource Needs	IRP checklist: #7, #19
Ch. 4: Demand-Side Resource Options	IRP checklist: #4, #5
Ch. 5: Supply-Side Resource Options	IRP checklist: #3
Ch. 6: Preferred Resource Plan	IRP checklist: #1, #2, #6, #8, #9, #13, #14
Ch. 7: Action Plan	IRP checklist: #10, #11, #12, #20, #21
Ch. 8: Member and Public Input	IRP checklist: #15, #16, #22
Ch. 9: Approvals	IRP checklist: #17, #18

Cross-Reference with WAPA IRP Checklist

WAPA's current IRP checklist[2] is included as follows along with references to the appropriate chapters in the IRP report addressing each item on the checklist. **References to the IRP report chapter are added in blue text.** WAPA's instructions regarding the checklist are:

In general, each customer must prepare and submit an IRP to WAPA that considers its electrical energy resource needs (905.11(b)). In order to satisfy the specific requirements of the regulation, the IRP must address the following questions. If WAPA concludes that the customer has satisfactorily answered the questions, and that the IRP is otherwise reasonable, WAPA should approve the IRP.

[2] Current as of January 2022. www.wapa.gov/EnergyServices/IRP/Pages/review-checklist.aspx

1. Does the IRP evaluate the full range of alternatives for new energy resources (905.11(a))?
    - New generating capacity?
    - Power purchases?
    - Energy conservation and efficiency?
    - Cogeneration and district heating/cooling applications?
    - Renewable energy resources?

    Reference "Preferred Resource Plan" Ch. 6 (w/ info from Ch. 4 & 5)

2. Does the IRP provide adequate and reliable service to the customer's electric consumers (905.11(a))?

    Reference "Preferred Resource Plan" Ch. 6

3. Does the IRP take into account the necessary features for system operation (905.11(a))?
    - Diversity?
    - Reliability?
    - Dispatchability?
    - Other risk factors?

    Reference "Supply-Side Resource Options" Ch. 5

4. Does the IRP take into account the ability to verify energy savings achieved through energy efficiency (905.11(a))?

    Reference "Demand-Side Resource Options" Ch. 4

5. Does the IRP take into account the projected durability of such savings measured over time (905.11(a))?

    Reference "Demand-Side Resource Options" Ch. 4

6. Does the IRP treat demand and supply resources on a consistent and integrated basis (905.11(a))?

    Reference "Preferred Resource Plan" Ch. 6

7. Does the IRP consider electrical energy resource needs? The IRP may, at the customer's option, consider water, natural gas, and other energy resource options (905.11(b)).

    Reference "Resource Needs" Ch. 3

8. Does the IRP identify and compare resource options? The customer must conduct an assessment and comparison of available existing and future supply- and demand-side resource options based on its size, type, resource needs, geographic location and competitive situation. The options should relate to the customer's unique resource situation as determined by profile data (service area, geographical characteristics, customer mix, historical loads, projected growth, existing system data, rates and financial information) (905.11(b)(1)).

- Supply-side options include, but are not limited to, power purchase contracts, and conventional and renewable generation options (905.11(b)(1)(i)).
- Demand-side options alter the customer's use pattern to provide for an improved combination of energy services to the customer and ultimate consumer (905.11(b)(1)(ii)).
- Considerations that may be used to develop potential options include cost, market potential, consumer preferences, environmental impacts, demand or energy impacts, implementation issues, revenue impacts, and commercial availability (905.11(b)(1)(iii)).

Reference "Preferred Resource Plan" Ch. 6

9. Does the IRP clearly demonstrate that decisions were based on a reasonable analysis of the options (905.11(b)(1)(iv))?

   Reference "Preferred Resource Plan" Ch. 6

10. Does the IRP include an action plan describing specific actions the customer will take to implement the IRP (905.11(b)(2))?

    Reference "Action Plan" Ch. 7

11. Does the IRP list the time period that the action plan covers (905.11(b)(2)(i))?

    Reference "Action Plan" Ch. 7

12. Does the IRP include an action plan summary consisting of (905.11(b)(2)(ii)(a-c)):

    - Actions the customer expects to take in accomplishing the goals identified in the IRP?
    - Milestones to evaluate accomplishment of those actions during implementation?
    - Estimated energy and capacity benefits for each action planned?

    Reference "Action Plan" Ch. 7

13. Does the IRP, to the extent practicable, minimize adverse environmental effects of new resource acquisitions and document these efforts (905.11(b)(3))?

    Reference "Preferred Resource Plan" Ch. 6

14. Does the IRP include a qualitative analysis of environmental effects in a summary format (905.11(b)(3))?

    Reference "Preferred Resource Plan" Ch. 6

15. Does the IRP provide ample opportunity for full public participation in preparing and developing the IRP (905.11(b)(4))?

    Reference "Member & Public Input" Ch. 8

16. Does the IRP include a brief description of public involvement activities (905.11(b)(4))?

    - How the customer gathered information from the public?
    - How public concerns were identified?
    - How information was shared with the public?
    - How public comments were responded to?

    Reference "Member & Public Input" Ch. 8

17. Does the IRP document that each MBA member approved the IRP, confirming that all requirements have been met (905.11(b)(4)(i))?

    Reference "Approvals" Ch. 9

18. Does the IRP contain the signature of each MBA member's responsible official, or document passage of an approval resolution by the appropriate governing body (905.11(b)(4)(i))?

    Reference "Approvals" Ch. 9

19. Does the IRP contain a statement that the customer conducted load forecasting, including specific data (905.11(b)(5))?

    Reference "Resource Needs" Ch. 3

20. Does the IRP contain a brief description of measurement strategies for identified options to determine whether the IRP's objectives are being met (905.11(b)(6))?

    Reference "Action Plan" Ch. 7

21. Does the IRP identify a baseline from which the customer will measure the benefits of IRP implementation (905.11(b)(6))?

    Reference "Action Plan" Ch. 7

22. Does the IRP specify the responsibilities and participation levels of individual members of the MBA and the MBA (905.12(b)(2))?

    Reference "Member and Public Input" Ch. 8

Additional Documents and Resources

In addition to public documents and information referenced in this report, the analyses documented in this report are supported by data and information available from a number of supplemental documents and sources that are not otherwise publicly available. These documents may be available for review by WAPA, if requested and deemed necessary, with acceptable handling protocols and confidentiality.

Chapter 2: Current Resources

The CIPCO system employs a variety of demand-side, supply-side, and transmission resources to meet the power needs of its member systems in a reliable and economical manner. Demand-side resources include programs designed to promote energy-efficient technologies to reduce energy consumption or shift load to off-peak hours. Energy-efficiency programs are complemented by interruptible load programs to reduce the amount of power used at times of high system demand. In addition, at least two of CIPCO's member systems have implemented time-of-use (TOU) retail rates. Supply-side resources include large, central-station power plants, smaller generation resources, numerous wind and solar facilities, and both short-term and long-term power purchase contracts. The transmission networks of CIPCO and its regional partners deliver power from supply resources to the distribution systems of its members systems in an efficient and reliable manner. The distribution networks of its member systems integrate with the transmission system and deliver power to consumers' homes and businesses.

CIPCO's current portfolio of resources is described in detail in this chapter.

Demand-Side Resources

CIPCO has a long history of promoting the installation of energy-efficient products and has educated customers about the benefits of energy efficiency. Since 1985, CIPCO and its member systems have offered a wide range of Demand-Side Management (DSM) programs designed to provide value to its membership base while promoting consumer interest in energy efficient products and behaviors.

From 1985 to 2008, the number and type of DSM programs offered by CIPCO and its member systems expanded significantly to optimize resource utilization and best deliver products to consumer-members. Refinements in the 2008 to 2010 period re-focused CIPCO's portfolio of DSM programs toward the efficiency of electrical equipment, with a reduced emphasis on programs influenced by fuel switching. These refinements increased the number of measures offered to the agricultural, commercial, and industrial sectors. During this time, CIPCO added incentives for heat pump water heaters, appliance recycling, LED lighting, and a wider variety of technologies. In recent years, measures conforming with beneficial electrification principles have been added to CIPCO's portfolio of offerings.

CIPCO completed a comprehensive energy efficiency potential study in 2014 to determine the technical, economic, achievable, and programmatic energy-efficiency potential within its service territory. This study supported CIPCO's 2015-2019 Energy Efficiency Plan[3], as was required by Iowa law at that time. As part of that effort, many previous measures were dropped from programs and selected new measures were added. Much of the structural changes implemented at that time remain in place and the program's attributes follow the guidelines established at that time. A limited number of changes have been made since that time for measures with new energy efficiency standards or technologies that were previously incentivized or where substantial market transformation had already occurred, such as high-efficiency lighting.

[3] "CIPCO Energy Efficiency Plan 2015-2019", September 2014, prepared by The Cadmus Group, Inc.

In 2018, The Iowa legislature passed and Iowa Governor Reynolds signed a bill[4] exempting electric cooperatives and municipal utilities from the need to file five-year energy efficiency plans and implement energy efficiency programs. CIPCO has continued to promote cost-effective energy efficiency and beneficial electrification programs since that time, although it no longer develops a formal five-year plan to meet the Iowa requirements. New measures are evaluated on an ongoing basis and are added to programs if they meet criteria and add value to the CIPCO system and its membership. See Section 4.0 for additional information about DSM programs and measure evaluation.

CIPCO's current portfolio of DSM program offerings is presented in Table 1.

Table 1 - CIPCO DSM Program Measures

Residential		
Geothermal Heat Pumps	Heat Pump Water Heaters	Residential Weatherization
Air Source Heat Pumps	De-superheaters	Appliance Recycling
Heat Recovery Ventilation	Energy Star Clothes Washers	All Electric Homes
Central Air Conditioners	Cold Climate Heat Pumps	Outdoor Security Lighting
Commercial & Industrial		
Geothermal Heat Pumps	Water and Air-Cooled Chillers	Commercial Indoor Lighting
Air Source Heat Pumps	Variable Speed Drives	Outdoor Lighting
Commercial Air Conditioners	Heat Recovery Ventilation	Custom Rebates
Commercial Kitchen Equipment	Electric Forklifts	
Agricultural		
Livestock Ventilation Fans	Livestock Circulation Fans	Horticultural LEDs
Farrowing Heat Pads	Efficient Livestock Waterers	Dairy Milk Pre-Coolers
Dairy Variable Speed Vacuum Pumps	Dairy Scroll Compressors	Dairy Heat Reclaimers

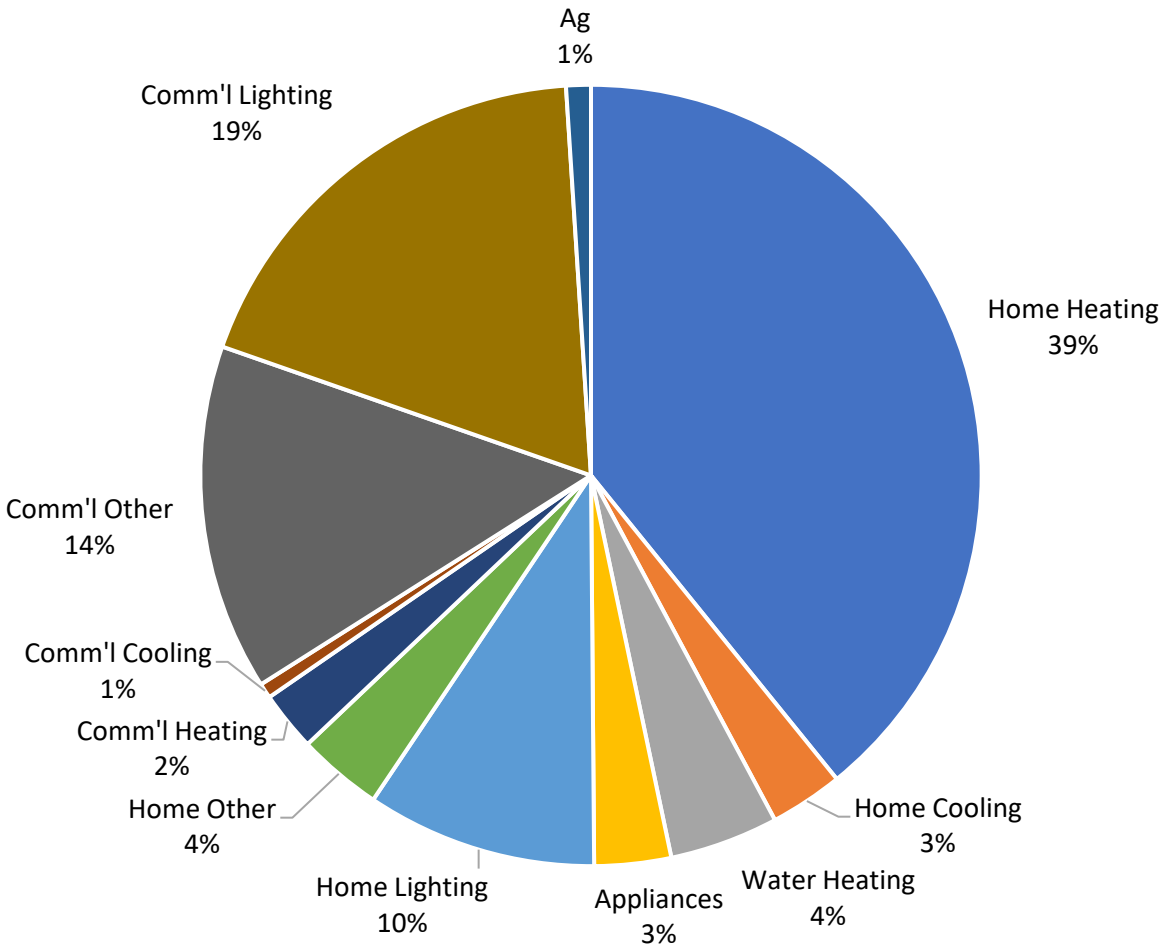
The promotion of energy efficiency measures such as efficient air conditioning equipment (including electric heat pumps), agricultural ventilation, and lighting have reduced CIPCO's summer energy consumption and peak demand, the key drivers of CIPCO's incremental resource needs, compared to a status quo scenario.

The estimated cumulative energy impact shares from CIPCO's DSM programs in 2020 are illustrated in Figure 2[5]. This allocation includes the magnitude of electric use impacts for each program, including some that have a positive (increase) electric impact due to fuel switching. Nearly 40 percent of the 2020 program impact comes from home heating while nearly 30 percent comes from home or commercial lighting. Although most of the home indoor lighting incentives have recently been eliminated, the cumulative impacts of installations made in recent years will continue to be tracked until those measures reach the end of their useful life. LEDs have now become the standard technology in most home indoor applications and the market has been permanently transformed.

[4] SF 2311 signed May 3, 2018

[5] 2021 data was not available at the time of IRP development

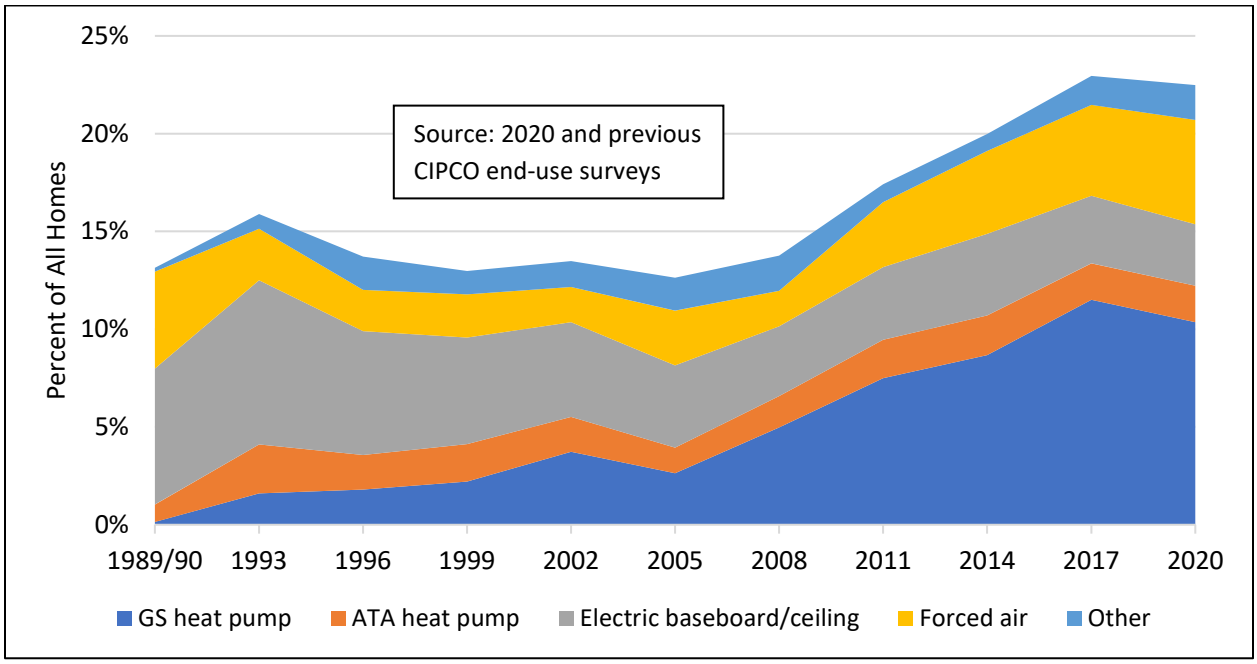
Figure 2 – CIPCO Cumulative DSM Program Impacts Through 2020



On a cumulative basis since inception, CIPCO's DSM programs have decreased CIPCO's summer peak demand, which is a primary goal of the programs. The overall cumulative electricity consumption impact is negative in the summer but positive during the winter months due to consumers' selection of high-efficiency electric heat pump equipment over non-electric heating alternatives. This causes a reduction in overall energy consumption (on a BTU basis) but an increase in electricity consumption during the winter months. The overall upward impact on annual electric sales has decreased since 2010 due to increased promotion of high-efficiency electrical equipment and reduced fuel switching, and the cumulative net annual electric impact of CIPCO's DSM programs is now negative (indicating decreased overall annual electricity use).

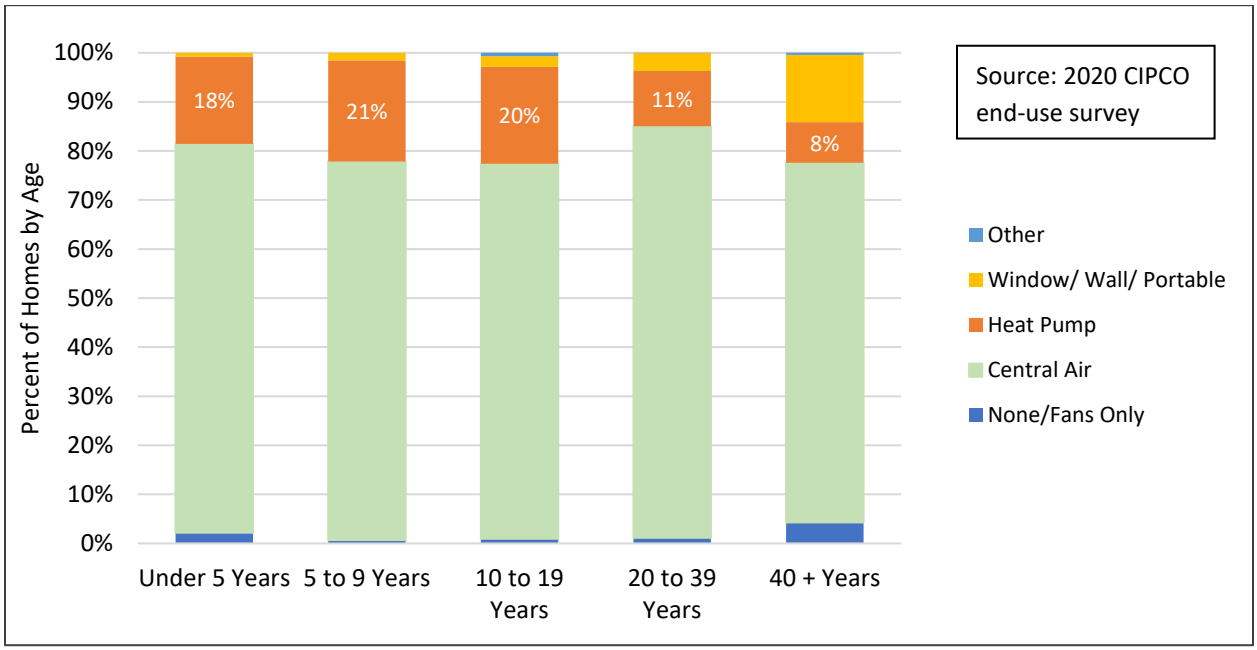
CIPCO's DSM programs have contributed to a notable impact on appliance ownership trends within its system. Data from CIPCO's end-use surveys indicate that ground-source (geothermal) heat pumps have been displacing electric resistance heating on the CIPCO system, as illustrated in Figure 3.

Figure 3 - Electric Heating Equipment Share Trends



Promotion of high-efficiency heat pump equipment has also led to increasing heat pump saturations for home air conditioning over the past two decades. Figure 4 illustrates the air conditioning system types by the age of the home from the 2020 end-use survey. Approximately 20 percent of homes built within the past 20 years have heat pump air conditioning equipment compared to approximately 10 percent of homes that are 20 years old or older.

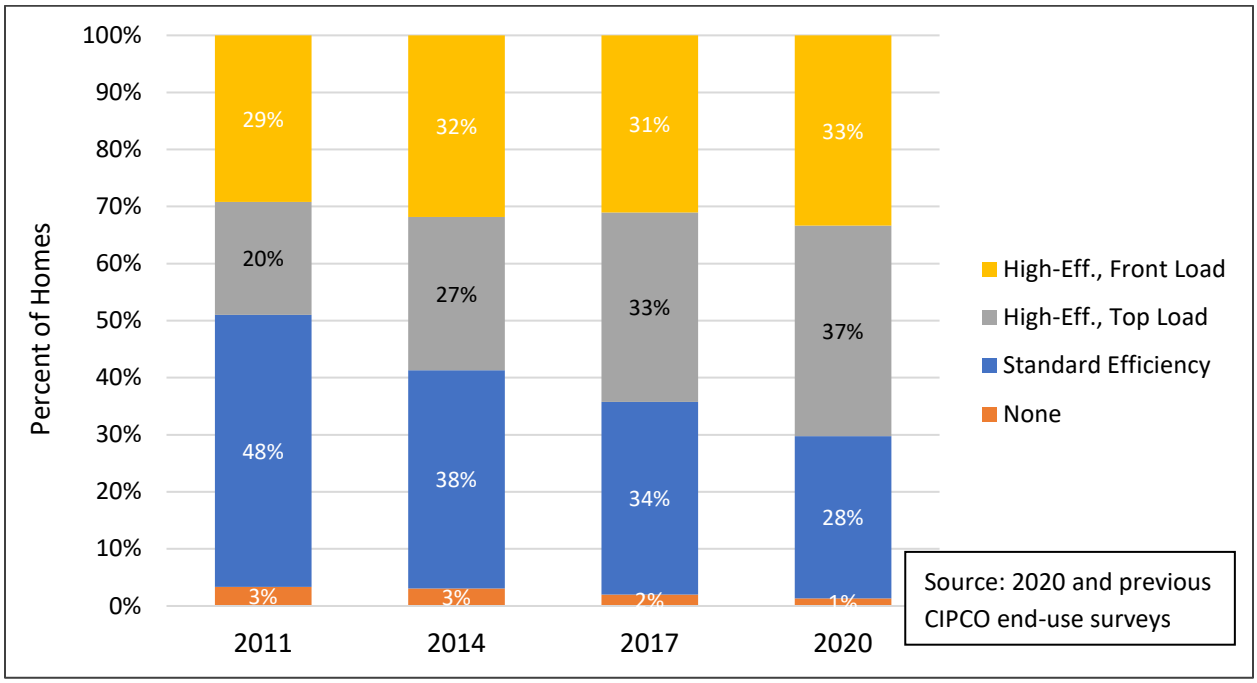
Figure 4 - Primary Home Cooling System by Age of Residence



Recent end-use surveys also track market transformations occurring on the CIPCO system due, in part, to promotional programs offered by CIPCO and its member systems. The 2020 end-use survey indicated:

- Seventy percent of homes have a high-efficiency clothes washer (front or top loading). This has increased from less than one-half in the 2011 survey, as illustrated in Figure 5.
- Over 80 percent of homes use some LED lighting, with 15 percent using all LED lighting. This is up from only 40 percent of homes that had any LED lighting in the 2014 survey.
- Eighteen percent of homes use heat pump technology for water heating, including 14 percent using heat recovery from geothermal heat pumps and four percent with stand-alone heat pump water heaters.

Figure 5 – Clothes Washer Type Trends



CIPCO and its member systems have promoted energy efficient appliances for several decades and have helped enable these market transformations through promotion and incentives. The next end-use survey is scheduled for 2024 and will continue to track appliance trends and market transformations among the CIPCO membership.

CIPCO's commercial and industrial (C&I) and agricultural DSM programs have reduced C&I electricity sales by approximately four percent in 2020 (cumulative). Over time, the increase in electric use attributed to heat pump programs and fuel switching have been more than offset by the efficiency impacts of the other commercial and industrial DSM programs such as lighting retrofits, variable speed drives, and customized energy-efficiency improvements.

These long-term DSM impact estimates are integrated into CIPCO's 2021 load forecast study, which is a cornerstone of the resource needs discussed in Chapter 3. Overall, the total impact of all DSM programs on total energy requirements is estimated to be a decrease of 16,500 MWh in 2020, or approximately 0.6 percent of 2020 total annual energy requirements with increases in winter energy consumption (due to heat pumps and fuel switching) and decreases in summer energy consumption. The summer peak demand savings are estimated to be 24 MW in 2020 and are expected to decline slightly over time primarily due to the recent market transformation in lighting. LED deployment has become widespread through new standards instead of active DSM programs, and incentives are being discontinued except for custom lighting and outdoor applications that are excluded from the new standards. CIPCO's winter peak demands increase as a result of DSM programs largely due to the addition of electric heat pumps that displace propane or natural gas heating equipment. While providing consumers with overall energy savings on a BTU basis, heat pumps increase winter electricity consumption and winter peak demand due to fuel switching away from other fuels.

CIPCO conducted a cost-of-service and rate design study in 2021 and will be implementing a time-of-use (TOU) wholesale rate to send relevant market signals to its member systems. As proposed for implementation in a few years, the on-peak energy period would be 4:00 p.m. to 9:00 p.m. (HE 17-21) every day for all months of the year. All other hours would be considered off-peak. At least two of CIPCO's member systems have TOU rates currently in place for all retail customers with higher rates during peak periods. While the impacts of these programs on the CIPCO system's peak demands are yet undetermined, the rates provide an incentive for consumers to shift electricity consumption away from the CIPCO system's peak periods if they choose to do so. With the widespread installation of AMI technologies, TOU rates may become more common in the coming years.

CIPCO initiated an interruptible rate schedule in 1995 that provides qualifying C&I consumers with the opportunity to reduce their power costs by installing back-up generation for use during periods of system load curtailment. Interruptible rates offered to medium-to-large C&I customers are used to:

- Lower power costs by reducing the need for marginal supply-side resources;
- Provide competitive offerings for the C&I sector; and
- Provide a resource that can be used to reduce demand during peak periods.

Sixteen C&I customers were on an interruptible schedule in 2020. The total potential interruptible load impact at the time of CIPCO's 2021 summer peak demand is approximately 10 MW (including losses). The requirements and structure of the A-2 interruptible program are being reviewed by CIPCO and its member systems to determine ways to encourage greater participation, although no changes have yet been finalized. Potential changes in MISO's resource adequacy requirements may impact the program attributes within the next few years and are being monitored and assessed by CIPCO staff.

CIPCO has tracked its energy-efficiency program participation and impacts since program inception in the 1980s. Annual participation and energy impacts (at the retail meter; excluding system losses) for DSM programs are summarized over the 2016 to 2020 period in Table 2.

Table 2 – DSM Program Participation and Impacts 2016-2020

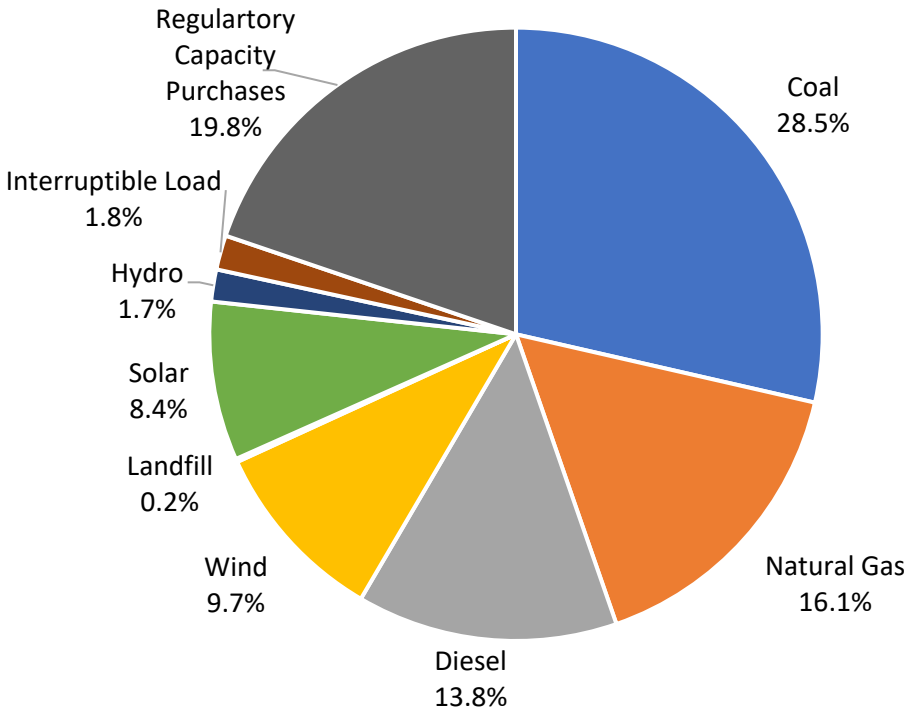
	Incremental New Participants - CIPCO					Cumulative MWh Impacts - CIPCO				
Residential Programs	**2016**	**2017**	**2018**	**2019**	**2020**	**2016**	**2017**	**2018**	**2019**	**2020**
Heat Plus	25	25	36	56	51	10,889	11,088	11,342	11,724	12,173
Dual Fuel	0	0	0	0	0	8,317	6,710	5,465	4,409	3,378
Interruptible	0	0	0	0	0	1,487	943	646	453	332
Air Source Heat Pumps	288	293	1,073	649	697	19,455	20,049	22,393	25,680	28,077
Geothermal Heat Pumps	466	307	262	297	388	39,599	39,341	39,061	38,856	38,358
Conventional Water Heater	0	0	0	0	0	80	40	8	0	0
Premium Quality Water Heater	784	589	865	1,384	1,277	12,157	10,609	8,949	7,309	5,742
Drain Water Recovery Pipe	0	0	0	2	2	(3)	(3)	(3)	(4)	(5)
Heat Pump Water Heater	141	129	79	99	240	(2,022)	(2,280)	(2,476)	(2,642)	(2,955)
All Electric Home	53	36	23	34	64	771	569	357	106	(148)
Indoor Air Quality	0	0	0	0	0	0	0	0	0	0
Heat Recovery Ventilation	118	109	97	103	95	(250)	(273)	(295)	(315)	(336)
Central Air Conditioners	881	864	1,962	1,772	1,896	(4,204)	(4,225)	(4,424)	(4,734)	(5,027)
Energy Star Clothes Washer	207	230	306	372	359	(2,566)	(2,601)	(2,585)	(2,526)	(2,449)
Energy Star Dishwasher	0	0	0	0	0	(1,014)	(1,014)	(998)	(950)	(879)
Energy Star Refrigerator	0	0	0	0	0	(702)	(702)	(695)	(678)	(654)
Freezer	0	0	0	0	0	(85)	(85)	(85)	(85)	(85)
Dehumidifier	0	0	0	0	0	(106)	(106)	(106)	(106)	(106)
Efficient Television	0	0	0	0	0	(319)	(319)	(319)	(319)	(319)
Electronic Recycling	961	1,054	2,056	1,831	1,618	(3,507)	(3,250)	(2,820)	(2,474)	(2,289)
Residential Indoor Lighting (# bulbs)	332,959	284,796	161,261	180,502	55,201	(32,072)	(31,081)	(27,370)	(20,457)	(14,573)
Outdoor Security Lighting	1,764	1,942	1,404	3,841	4,242	(2,323)	(2,929)	(3,436)	(4,339)	(5,829)
E-Star Window Air Conditioner	0	0	0	0	0	(36)	(36)	(35)	(33)	(31)
Low Flow Aerators	87	55	0	0	0	(131)	(141)	(145)	(145)	(145)
Low Flow Showerheads	87	71	0	850	0	(398)	(428)	(442)	(605)	(769)
WH Tank and Pipe Insulation	0	0	0	0	0	(15)	(15)	(15)	(15)	(15)
Residential Weatherization	71	57	12,209	204	177	(630)	(685)	(3,790)	(6,933)	(7,029)
Window Air Conditioner	0	0	0	0	0	0	0	0	0	0
Storage Water Heating	0	0	0	0	0	0	0	0	0	0
ETS Space Heating	0	0	0	0	0	30	23	8	0	0
Residential Total						42,400	39,198	38,185	41,176	44,417
Commercial & Ag. Programs										
Comm'l Air Source Heat Pumps	13	61	34	92	85	963	991	1,027	1,075	1,144
Comm'l Geothermal Heat Pumps	584	158	103	385	520	2,431	2,404	2,361	2,292	2,167
Comm'l Heat Recovery Ventilation	57	15	93	84	57	(353)	(394)	(456)	(556)	(636)
Premium Motors	0	0	0	0	0	(20)	(20)	(20)	(20)	(20)
Variable Speed Drives	9	21	16	29	53	(3,288)	(3,750)	(4,341)	(4,765)	(5,534)
Comm'l Indoor Lighting (#bulbs)	47,940	57,689	124,373	85,079	61,092	(21,950)	(25,534)	(30,703)	(36,298)	(39,822)
Dairy Pre-Cooler	12	2	1	10	10	(730)	(779)	(758)	(722)	(683)
Livestock Ventilation Fans	174	214	289	513	501	(283)	(361)	(408)	(388)	(479)
Livestock Circulation Fans	0	0	5	44	1	(139)	(139)	(139)	(146)	(152)
Livestock Equipment	35	327	5	188	240	(629)	(654)	(671)	(734)	(873)
Custom C&I	1	3	2	119	2	(2,050)	(2,607)	(3,333)	(14,229)	(25,088)
Comm'l & Ag. Total						(26,048)	(30,842)	(37,441)	(54,490)	(69,976)

Note that the cumulative energy impacts for some programs decline even though new participants are being added. This is due to retirements of previously-installed measures that are captured in the cumulative MWh that more than offset the impacts of new participants. This is most noticeable in the residential indoor lighting program that is being phased out due to new efficiency standards but is also evident in other programs that have been in place for many years or decades.

Supply-Side Resources

CIPCO's supply-side resources consist primarily of power plants, distributed generation facilities, long-term power purchases, and supplemental short-term power purchases. CIPCO utilizes natural gas, coal, hydro, solar, landfill gas (LFG), and wind power in its supply mix. This diverse power supply mix consists of 506 MW of accredited summer capacity[6] that meets a large portion of CIPCO's capacity requirements. This is supplemented by regulatory capacity purchases and load modifying resources to meet CIPCO's resource adequacy requirements. CIPCO is currently in the process of adding resources to replace the capacity and energy from a nuclear plant that closed in 2020. CIPCO's accredited capacity shares for the 2021-2022 planning year are illustrated in Figure 6.

Figure 6 – CIPCO 2021-2022 Accredited Capacity Shares



CIPCO's joint ownership of several baseload units contributes to diversity by spreading ownership risk over multiple parties and reducing CIPCO's dependence on any single resource. Joint plant ownership also enhances economies of scale, allows for high-volume fuel procurement, and provides other benefits associated with operating large, central-station generation assets. Over the past five years, CIPCO has enhanced its supply flexibility with new gas-fired units at Summit Lake and has increased its long-term purchases from wind and solar resources. CIPCO continues to evaluate new opportunities for power supply with a focus on wind, solar, and energy storage technologies. With the exception of the hydro, all of CIPCO's owned and long-term purchased energy resources are located in the state of Iowa.

[6] Zonal Resource Credit for the MISO 2021-2022 planning year, including SIMECA and municipal generation

This commitment to diverse supply-side resources and ownership structures enables CIPCO to provide reliable power to its member-systems. Diverse fuel sources reduce dependencies on any one fuel type, fuel source, and fuel delivery method. Some reliance on electric power purchases contributes to diversifying the resource mix, eliminates ownership risks, and increases overall reliability. Most of CIPCO's purchases are price-certain, long-term contracts that allow for greater financial certainty while limiting exposure to the variability of the open market. Short-term contracts allow CIPCO to meet any additional needs without committing to long-term arrangements, and to provide flexibility to address near-term load variations.

CIPCO considers itself an environmental steward and takes that role into consideration when evaluating supply-side resources. This stewardship is a key element in the evaluation of power purchase contracts or ownership of future facilities to supplement and fortify an already diverse portfolio.

In addition to a diverse energy portfolio, CIPCO members continue to achieve scale from ongoing participation in a broad and economically-robust pooling arrangement with Alliant Energy/IPL. CIPCO is able to participate in this resource mix at a scope and scale that exceeds 4,000 MW (nameplate), while gaining access to the larger MISO power market with its abundance and diversity of resources.

CIPCO's major supply-side resources are described in the following sections.

CIPCO-Owned Generation

CIPCO owns all or a portion of eight generating units at four central-station power plants in Iowa. The size, ownership share, and operators of these plants are summarized in Table 3. Each plant is briefly described following the table.

Table 3 - CIPCO-Owned Generation

	Total Plant Capacity	CIPCO Ownership Share		Plant Operator
	Nameplate MW	MW	%	
Louisa Generating Station	812	37.4	4.6%	MidAmerican Energy
Walter Scott #3	726	83.5	11.5%	MidAmerican Energy
Walter Scott #4	923	88.1	9.55%	MidAmerican Energy
Summit Lake (two combustion turbines, three reciprocating engines)	123.8	123.8	100%	CIPCO

Louisa Generating Station

Louisa Generating Station (Louisa) is a coal-fueled generation plant located near Muscatine, Iowa that began operation in 1983. CIPCO owns 4.6 percent of this 812 MW facility, which is operated by MidAmerican Energy. Louisa is equipped with an Electrostatic Precipitator (ESP) with flue gas conditioner, activated carbon injection, scrubber, baghouse, low-NO_X burners with overfire air, and was originally constructed with cooling towers.

Walter Scott, Jr. Energy Center

Walter Scott, Jr. Energy Center #3 (WS #3) is a unit of the Walter Scott, Jr. Energy Center complex, located near Council Bluffs, Iowa. CIPCO owns 11.5 percent of this 726 MW coal-fired generation unit. MidAmerican Energy operates the facility, which began production in 1979. WS #3 is equipped with an ESP, activated carbon injection, scrubber, baghouse, and low-NO_X burners with overfire air.

Walter Scott, Jr. Energy Center #4 (WS #4) is the newest unit at the complex. Production began in 2007 at this 923 MW coal-fired facility. CIPCO owns 9.55 percent, or 88 MW, of this unit. WS #4 is equipped with a Selective Catalytic Reduction (SCR), scrubber, baghouse, activated carbon injection, low-NO_X burners with over-fire air, and cooling towers.

Summit Lake

Summit Lake is located near Creston, Iowa and is a peaking generation plant consisting of two dual-fuel combustion turbines and three natural gas-fired reciprocating engines of 18.8 MW each that were brought on-line in April 2021. Three steam turbines at Summit Lake were retired in March 2021 as part of the repowering project. The total nameplate capacity of the plant is 123.8 MW.

NextEra Energy Duane Arnold LLC - Retired 2020

The NextEra Energy Duane Arnold plant (previously the Duane Arnold Energy Center, DAEC), located near Palo, was Iowa's only nuclear generating facility and was retired following the derecho storm that occurred in August 2020 a few months prior to its October 2020 scheduled retirement. CIPCO owned a 20 percent share of the 622 MW facility which was operated by NextEra Energy. Duane Arnold began commercial operation in 1974 and received a license extension from the Nuclear Regulatory Commission (NRC) allowing it to operate until 2034, but it was deemed uneconomic to continue operation past 2020.

Long-Term Power Purchase Agreements

In addition to ownership of generation resources, CIPCO purchases substantial amounts of power through long-term power purchase agreements (PPAs) and contracts for the use of the diesel generation resources of SIMECA members and other member-served municipal utilities as part of its system resources.

Western Area Power Administration (WAPA)

CIPCO receives energy from the Upper Great Plains Region of WAPA, a Federal Power Marketing Administration. CIPCO's allotment of WAPA power averages approximately 14 MW per month of hydroelectric power from dams on the Missouri River in Montana, North Dakota, and South Dakota through a power purchase contract.

Heartland Divide Wind Energy Center

CIPCO purchases 103.5 MW from the Heartland Divide Wind Energy Center, owned by NextEra Energy Resources, that began operation in late 2018. Located in Audubon and Guthrie counties, all output from the Heartland Divide project is contracted to CIPCO through 2038.

Elk Wind Farm

CIPCO purchases 100 percent of the output from the Elk Wind Farm, which began operation in 2011. Elk Wind Farm is a 41.25 MW wind facility located in Delaware County, Iowa and is owned by Greenbacker Renewable Energy Company. CIPCO purchases the output from this wind farm through a long-term PPA extending through 2031.

Hawkeye Wind Farm

The Hawkeye Wind Farm near Hawkeye, Iowa began production in 2012 and is owned by Greenbacker Renewable Energy Company. It provides a maximum of 37.5 MW of power to CIPCO through a long-term contract extending through 2037.

Rippey Wind Farm

The Rippey Wind Farm near Grand Junction, Iowa began production in 2012 and is owned by Greenbacker Renewable Energy Company. It provides a maximum of 50 MW of power to CIPCO through a long-term contract extending through 2037.

Pioneer Grove Wind Farm

The Pioneer Grove Wind Farm is located near Mechanicsville, Iowa and is owned by Acciona Windpower. CIPCO began purchasing 6 MW of power in 2012 with the contract extending until 2032.

Independence Wind Energy Project

The Independence Wind Farm is located near Ryan, Iowa with an installed capacity of 54 MW. The Independence project is currently owned by BHE Renewables and began commercial operations in December 2021. CIPCO has entered a 20-year purchased power agreement for the full output of the facility.

Cooperative and Small Wind Turbines

There are a number of wind turbines on member cooperative systems in CIPCO's service territory, ranging in size from 1.6 MW to 4.0 MW each. CIPCO has PURPA contracts for 100 percent of the output from this group of turbines. CIPCO also has small wind turbines on its system that first serve local municipal or cooperative load. Any excess energy produced by the

1.5 to 1.6 MW turbines is purchased by CIPCO. The nameplate capacity of these smaller wind purchases totals 25 MW.

Linn County Solid Waste Agency

In 2013, CIPCO began purchasing approximately 1.6 MW of waste-to-energy power from the Linn County Solid Waste Agency, located near Marion, Iowa and owned by Linn County. This contract extends through 2033.

Wapello Solar

The Wapello Solar project, owned by Clēnera $_{LLC}$, includes 318,000 bifacial solar panels spread across a portion of 800 acres of sub-prime farm ground located south of Wapello, Iowa. CIPCO has contracted to purchase all output from this 100 MW_{AC} facility through an exclusive 25-year contract that began in March 2021.

Coggon Solar

The 100 MW_{AC} Coggon Solar project has recently received local planning and zoning approval and is being developed by Clēnera $_{LLC}$. Initial commercial operations were scheduled for the end of 2022 as reflected in the financial analysis and preferred resource plan documented in this report, although the project has been delayed and initial operation is expected in 2023. This project is similar in size and scope to the Wapello Solar project, and CIPCO will purchase all output from this facility for a term of 20 years once it begins commercial operations.

Small Solar Power Generation Facilities

CIPCO contracted for development of multiple small solar power facilities as part of its initial investment in solar power for its membership. Phase 1 of CIPCO's initial solar developments included a total nameplate capacity of 4.42 MW_{AC}, all of which were energized by the end of 2016. Phase II included additional solar facilities totaling 1.98 MW_{AC} that came on-line in January 2018. CIPCO has 9-year contracts to purchase output from these facilities.

SIMECA and Other Municipal-Owned Generation

Most of the SIMECA communities and some other municipal utilities to which CIPCO's members provide either full or partial requirements have back-up municipal generation in the form of diesel-fueled reciprocating internal combustion engines. In total, CIPCO has the potential to purchase approximately 95 MW from these resources. CIPCO only purchases what is available from generating units that are fully compliant with the latest EPA standards. To the extent municipals continue to maintain their engines to comply with these standards, CIPCO will continue to purchase power from them in the future.

Miscellaneous Power Purchase and Sale Agreements

In order to supplement its owned resource base, CIPCO periodically enters into power purchase and sale agreements. This is done to help ensure reliability and enhance the overall system economics. Typically, annual regulatory capacity purchases are made to meet load and capability requirements, and baseload energy purchases are made to manage energy supply costs.

Transmission Resources and Facilities

CIPCO's transmission and sub-transmission facilities consist of 32 miles of 345 kV, 285 miles of 161 kV, 14 miles of 115 kV, 1,174 miles of 69 kV, and 407 miles of 34 kV line including the CIPCO portion of jointly-owned lines. CIPCO provides power to 308 unique metering points which then provide power to the distribution systems of its member systems.

CIPCO continues to improve the efficiency of its transmission system and coordinates with its member systems to improve overall system efficiencies, including the installation of low-loss transformers that decrease losses by an estimated 1.0 to 2.0 percent. This program has been in place for decades and has provided a significant amount of energy and peak demand savings to CIPCO and its member systems.

In addition, CIPCO coordinates with its member systems on their system construction work plans. Construction work plans evaluate and plan future system improvements, typically over a four-year period. Construction work plans assess and incorporate the following elements:

- A review of the current system infrastructure and performance
- An analysis of historic and future loads and trends
- A discussion of the planning criteria used in the plan, from both engineering and economic perspectives
- Recommendations for infrastructure improvements, including poles, wires, substations, and related equipment
- An assessment of the reliability and financial impacts of the recommended improvements on the system and its members

The first years of the most recent construction work plans completed by CIPCO's distribution cooperative members are included in the following list. These plans typically encompass a four-year period, but are occasionally extended if, for example, recommended work is not fully completed or if load growth slows below the levels anticipated in the work plans.

	Construction Work Plan
Cooperative	**Start Date**
Clarke	2020
Consumers	2016
Eastern Iowa	2022
East-Central Iowa	2017
Farmers	2020
Guthrie	2019
Linn	2020
Maquoketa Valley	2020
Midland	2019
Pella	2018
SW Iowa	2021
T.I.P.	2018

CIPCO is directly interconnected with MidAmerican Energy, ITC Midwest, WAPA, and several independent municipalities. ITC Holdings Corporation (ITC Midwest) purchased Interstate Power and Light Company's (an Alliant Energy subsidiary) transmission system in 2007. These direct interconnections enhance reliability and facilitate the purchase and sale of energy between CIPCO and neighboring systems.

CIPCO is a market participant in the Midcontinent Independent System Operator (MISO). MISO has responsibility for regional transmission system planning and reliability. CIPCO's participation in MISO allows it to be actively involved in the identification of, and planning for, new transmission lines within the CIPCO footprint or within the broader region that may impact the CIPCO system. Participation in MISO and membership in ACES (formerly known as "ACES Power Marketing") allows CIPCO to monitor and participate in MISO planning activities.

CIPCO and ITC Midwest have an Operating and Transmission (O&T) Agreement that allows mutual use of the integrated transmission system. CIPCO maintains an equitable investment of approximately 31 percent of the integrated system. This agreement allows mutually-beneficial transmission access, allows for shared responsibility for infrastructure costs and O&M costs, and helps ensure reliability across a broad portion of CIPCO's footprint.

Chapter 3: Resource Needs

CIPCO's future resource needs are determined primarily by changes in load, and to some extent, the characteristics of the load served. The impacts of DSM programs, planned changes to existing resources, and emerging issues such as consumer-owned generation, on-site energy storage, and electric vehicles (EVs) may also impact the outlook for future resource needs.

CIPCO has an established, comprehensive load forecasting process that annually updates forecasts for the CIPCO system and all of its member systems. The most recent load forecast was completed in the fall of 2021 and included forecasts over the 2021 to 2040 period. This forecast is generally consistent with the previous load forecast that is embedded into CIPCO's most recent financial forecast and resource plans. CIPCO's load forecasts form the basis for future capacity and energy needs that must be met through a combination of supply-side and demand-side resources. The impacts of DSM and on-site solar generation are explicitly incorporated into the base-case load forecast.

In addition to the load forecast, changes to existing generation resources and power purchases can impact the amount of new resources required over the planning horizon. The possible retirement of some generation units and the known expiration of an existing PPA are potentially significant changes to existing resources over the IRP planning horizon.

On-site solar continues to grow within the CIPCO system and comprised approximately 0.70 percent of residential retail electric sales and 0.84 percent of small C&I electric sales in 2020. These shares were projected to climb to approximately 2.0 percent of sales by 2040 but may go higher if the current solar tax credit is extended beyond its current sunset date of 2023[7].

The impacts of EVs are relatively small, with fewer than 200 EVs estimated to be on the CIPCO system in 2020. CIPCO and its member systems currently provide an incentive of $500 for Level 2 charging stations, with program participation providing information about EV growth trends. In addition, the Iowa DOT's vehicle registration data now separates EVs at the county level, and CIPCO is monitoring growth in key counties. Future EV growth is uncertain but is being monitored for possible future incorporation into load forecasts, should the magnitude justify such treatment. Federal funding for EV charging stations in the 2021 Infrastructure Investment and Jobs Act, signed on November 15, 2021, will enable EV growth. EV incentives in the "Build Back Better" bill may significantly increase EV sales if it becomes law[8].

As noted previously, CIPCO's long-term guideline is to limit exposure to market price volatility and manage risks by supplying at least 80 percent of its regulatory capacity needs from owned resources and long-term PPAs. Depending on market conditions, CIPCO may deviate from this strategy for short periods to take advantage of market opportunities as they arise or to meet unexpected needs.

CIPCO's expected resource needs over the next 15 years are discussed in this section.

[7] The "Build Back Better" bill passed by the U.S. House on 11/19/21 extends the solar tax credit through 2028.
[8] The "Build Back Better" bill includes an incentive of up to $12,500 for EVs if certain criteria are met.

Load Forecast

The CIPCO load forecasting process is “bottom-up”. Forecasts for each of CIPCO’s member rural electric cooperatives are developed at the retail class level and are aggregated to the system level. Energy deliveries by CIPCO to distribution cooperatives include all retail sales plus their own use and distribution losses, less any non-CIPCO power purchases. Monthly peak demand forecasts are developed for each cooperative, including their contribution to the CIPCO system peak demand.

Load forecasts are developed for the SIMECA system and are allocated to each member system based on their share of load growth. SIMECA member forecasts include energy purchases from CIPCO and each SIMECA member’s contribution to the CIPCO system monthly peak demand.

The CIPCO system load forecast is the sum of all member systems’ energy purchases from CIPCO and coincident peak demands, plus CIPCO’s own use and transmission losses. In this manner, the forecasts across the entire CIPCO system are developed in a bottom-up manner using consistent data sources, methodologies, and assumptions. Load forecasts explicitly incorporate the historic impacts and projected impacts of DSM programs and on-site solar generation on energy sales and peak demands.

The most recent CIPCO load forecast is documented in a detailed report that was approved by its Board of Directors on October 5, 2021 and approved by the Rural Utilities Service (RUS) on November 29, 2021. The load forecast complies with RUS load forecasting regulations as detailed in 7 CFR, part 1710, Subpart E of the Federal Register.

The forecasting methodologies and results are summarized in the following sections.

Residential Class Forecasts

The residential class is the largest consumer class, comprising 55 percent of retail electricity sales across CIPCO’s 12 distribution cooperatives in 2020. Residential consumer forecasts for each of CIPCO’s distribution cooperatives are based on household forecasts for the primary counties served and a trend in the share of those households served. Average electric use per residential consumer forecasts are developed using both econometric and end-use modeling, with cooperative managers selecting a weighting between the two forecasts. The number of residential consumers is projected to increase at an average annual rate of 1.0 percent over the 2021 to 2040 forecast horizon, while average energy use per consumer increases slightly over time. Total sales to the residential class increase at an average annual rate of 1.1 percent over the 2021 to 2040 forecast horizon.

Commercial and Industrial Class Forecasts

CIPCO’s 12 distribution cooperatives served 14,467 small commercial and industrial (C&I) and 79 large C&I consumers in 2020, as reported on RUS Operating Report-Distribution (Form 7). Forecasts of the number of small C&I consumers and average energy use per consumer are developed using econometric modeling or judgment. Small C&I energy sales increase at an average annual rate of 1.5 percent from 2021 to 2040. Forecasts for large C&I customers are developed individually with input from the member systems. Energy sales to the large C&I class increase at an average annual rate of 1.8 percent from 2021 to 2040.

Other Retail Class Forecasts

CIPCO's member distribution cooperatives also serve consumers classified as seasonal, irrigation, street lighting, public authority, and sales for resale. Sales to these classes comprise less than five percent of total energy sales by the member distribution cooperatives, and forecasts are developed using trending techniques and judgment, with input from the member systems.

WAPA sales to the City of Stanton, Iowa are not included in these forecasts. The "net" power provided to Stanton (beyond its WAPA power purchase) is included as a resale consumer for Southwest Iowa REC.

Total Sales to Distribution Cooperatives

Total CIPCO electricity sales to its electric cooperative member systems are the sum of their retail electric sales plus their own use and distribution losses, less wind power purchased by one member system under a separate contract and some small purchases of excess retail solar generation by some of CIPCO's member cooperatives. Own use and losses are projected based on historic averages.

The impacts of CIPCO's DSM programs are incorporated into the base-case load forecasts presented in this section. Consumer-owned solar generation is also included in the base-case load forecast, as discussed previously.

Preliminary load forecasts for CIPCO's 12 member distribution cooperatives are reviewed with each member system manager in a formal review process that includes face-to-face meetings in person or by video conference. Based on each manager's input, the load forecasts are revised and finalized, and are formally approved by each member system manager.

SIMECA Forecasts

CIPCO also provides all or partial power requirements to 15 municipal electric systems who are members of the South Iowa Municipal Electric Cooperative Association (SIMECA). The SIMECA energy forecasts are developed using econometric modeling at the aggregate level and are allocated to the 15 systems based on historic growth shares. Monthly peak demand forecasts are developed for each system using a load factor approach. A data request was sent to each SIMECA system to solicit input, and forecasts were provided to each member system for comment. CIPCO sales to SIMECA increase at an average annual rate of 0.7 percent over the 2021 to 2040 forecast horizon.

The SIMECA forecasts included in the CIPCO power requirements represent the incremental power provided by CIPCO, beyond the purchases from WAPA by the cities of Corning, Fontanelle, Lenox, and Villisca and separate wind power purchases by Greenfield and Villisca.

Total CIPCO Energy Requirements and Peak Demands

CIPCO's total energy requirements forecast combines energy sales to distribution cooperatives, sales to SIMECA members, CIPCO's own use, and transmission losses. CIPCO's total energy requirements are projected to increase at an average annual rate of 1.3 percent over the 2021 to 2040 forecast period driven by a strong housing market, a healthy agricultural economy with higher commodity prices, and continued recovery in the business sector.

Monthly peak demand forecasts for the CIPCO system are developed by summing the coincident contribution of each member system to the CIPCO peak demand in each month, plus CIPCO's own use and transmission losses. CIPCO's annual system peak is expected to increase at an annual rate of 1.3 percent from 2021 to 2040.

The energy requirements and peak demand forecasts are provided both with and without the impacts of DSM programs. The "net" load forecasts including DSM are considered the base-case forecasts for planning purposes, while the "gross" load forecasts excluding DSM can be used as a starting point for evaluating demand-side resource alternatives.

CIPCO's annual energy requirements and seasonal peak demands are presented in Figure 7 and Figure 8, respectively. CIPCO is a summer-peaking utility on a normal-weather basis and is expected to remain so over the planning horizon. The peak demands that are illustrated represent the "operating" peak demands that would be recorded on the system. Firm peak demands are discussed later in this report and are also relevant for resource planning.

Figure 7 – CIPCO Total Energy Requirements

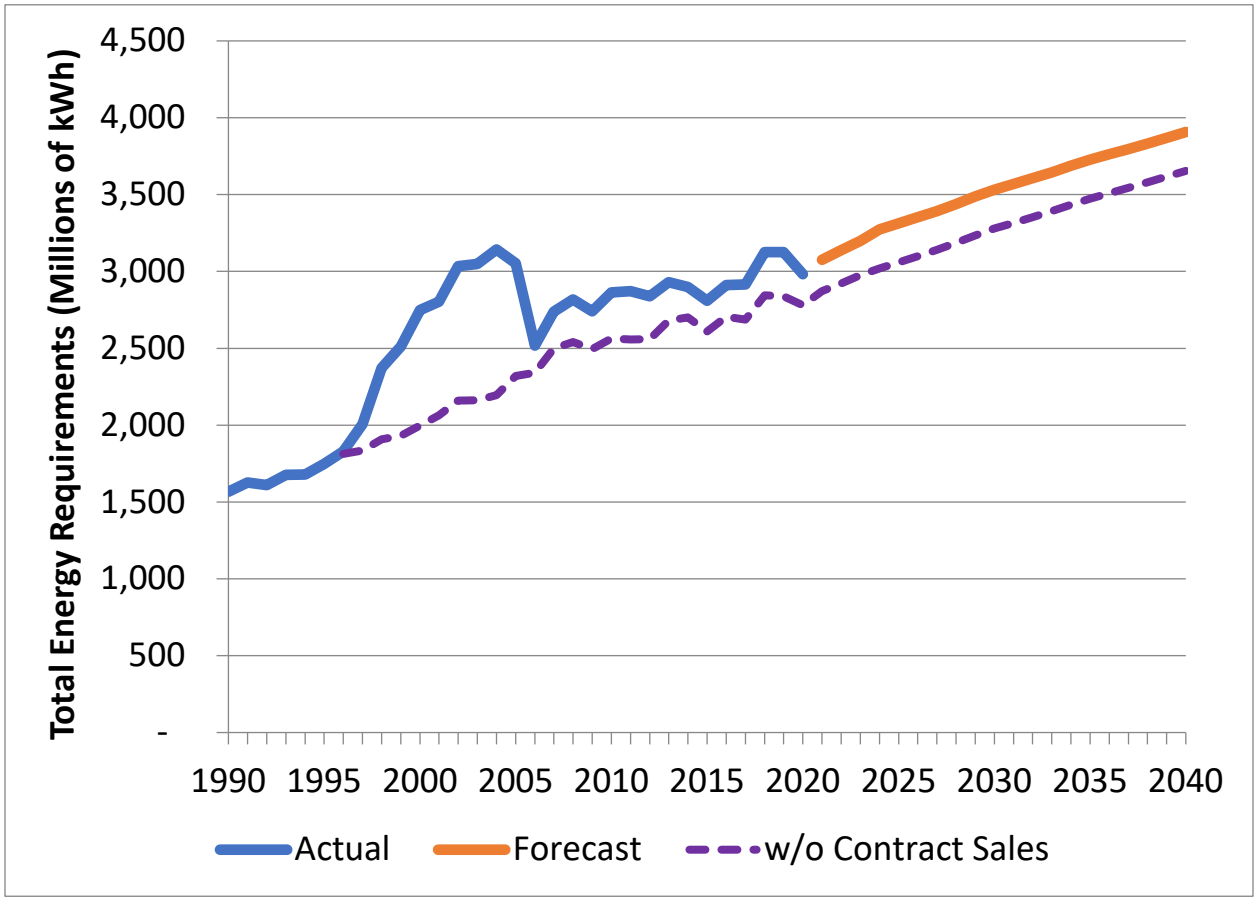
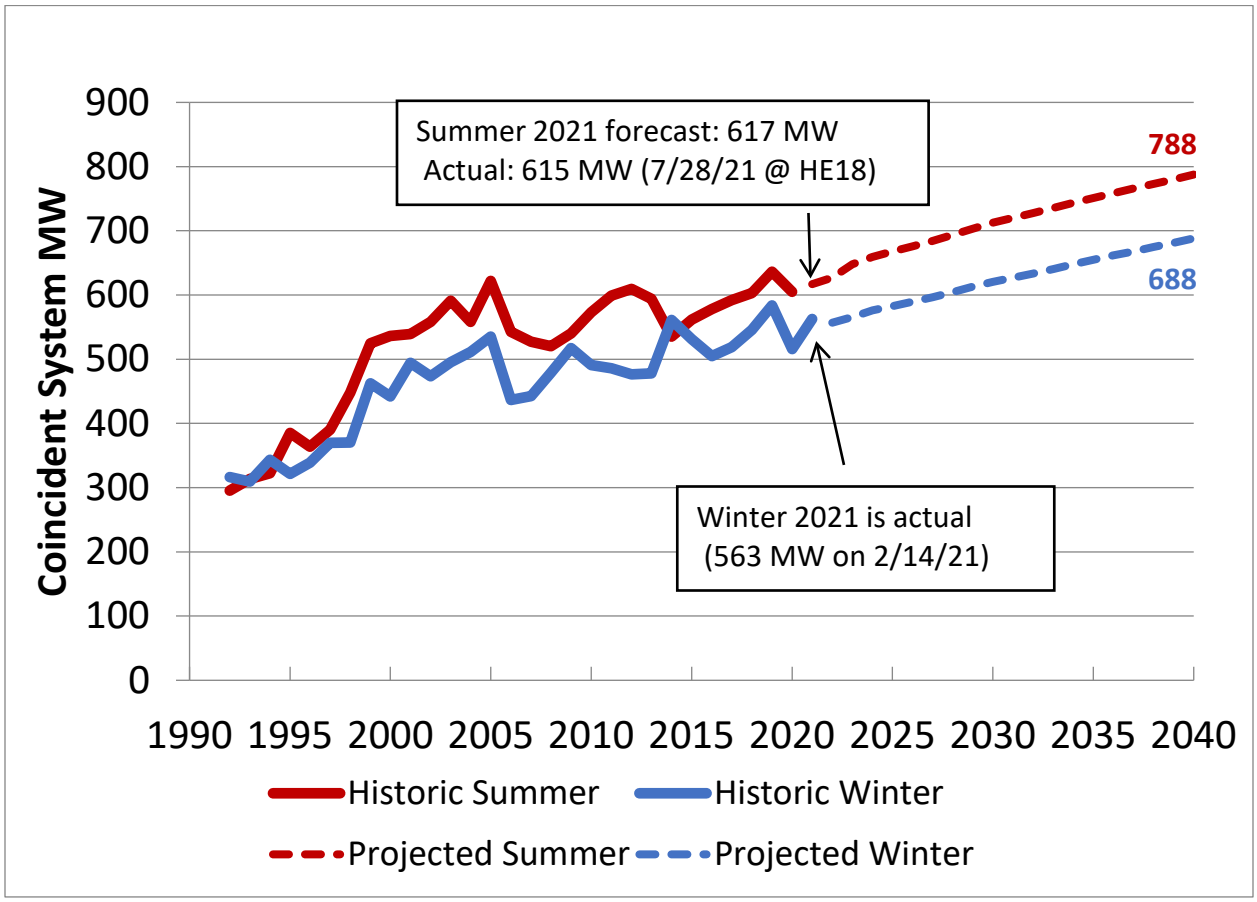


Figure 8 – CIPCO Seasonal Peak Demands



In addition to the "base-case" forecasts, CIPCO also develops a range of forecasts to reflect the uncertainty in future weather and economic conditions. The forecast scenario ranges include:

- Extreme weather with normal economic growth
- Mild weather with normal economic growth
- Rapid economic growth with normal weather
- Slow economic growth with normal weather

These ranges allow CIPCO to develop contingency resource and financial plans to respond appropriately to future conditions that will, in all likelihood, deviate somewhat from the assumptions used in the base-case forecast. They also correspond with the requirements of the RUS for evaluating load forecast uncertainty and developing forecast ranges, as documented in the load forecast report.

Changes to Existing Resources

While the load forecast is the primary determinant of future resource needs, changes to existing resources may influence the amount of power required from new resources.

Over the next 15 years, the only expected change to CIPCO's existing generation portfolio is the end of the Linn County Landfill PPA in 2033 (1.6 MW nameplate; 1.1 MW UCAP).

Other Drivers of Resource Needs

In addition to the load forecast variations and changes to existing resources, there are a number of factors that could impact CIPCO's future resource needs. Some examples include:

- Strong economic growth, either on a broad basis or industry-specific growth such as pipelines, ethanol facilities, data centers, or large warehouse and distribution operations.
- Widespread adoption of technologies that use significant amounts of electricity, such as electric vehicles or substantial conversion from fossil-fuel heating equipment to electric heat pumps.
- Future environmental regulations that could diminish the number of hours certain generation facilities could operate or cause facilities to be mothballed or retired.
- Relative changes in fuel prices.
- Substantial increases in the amount of small-scale, consumer-owned generation, potentially reducing the need for central-station generation and transmission. This presents challenges since increases in intermittent resources require ongoing grid and generation support.
- New technology advancement that could further accelerate the adoption of energy efficiency, demand response, and power storage resources to help support intermittent resources.

Resource Needs Summary

As discussed in this chapter, the impacts of load growth, potential generation unit retirements, expiration of PPAs, and the impacts of cost-effective DSM will require the acquisition of additional resources over the IRP planning horizon. Figure 9 and Table 4 provide CIPCO's projected resource needs and its existing resources available to meet those needs over the IRP horizon. Please note that the Coggon Solar facility is captured as an existing resource in this table since the agreement has been executed and it is currently under development. It is expected to begin commercial operation in 2023, although that is a recent change and the resource plan contained in the long-term financial forecast and in this report reflected it as a 2022 resource.

With only CIPCO's existing resources and known retirement or PPA expiration dates, CIPCO's resource requirements are expected to exceed its available resources by 208.5 MW by the 2036-2037 planning year as indicated in Figure 9 and Table 4. New resource acquisitions will consist of some combination of incremental DSM efforts, new generation resources, and new power purchase agreements. Those options and the preferred resource plan will be discussed in detail in subsequent chapters of this report.

Figure 9 – CIPCO Resource Adequacy BEFORE New Resources (MW)

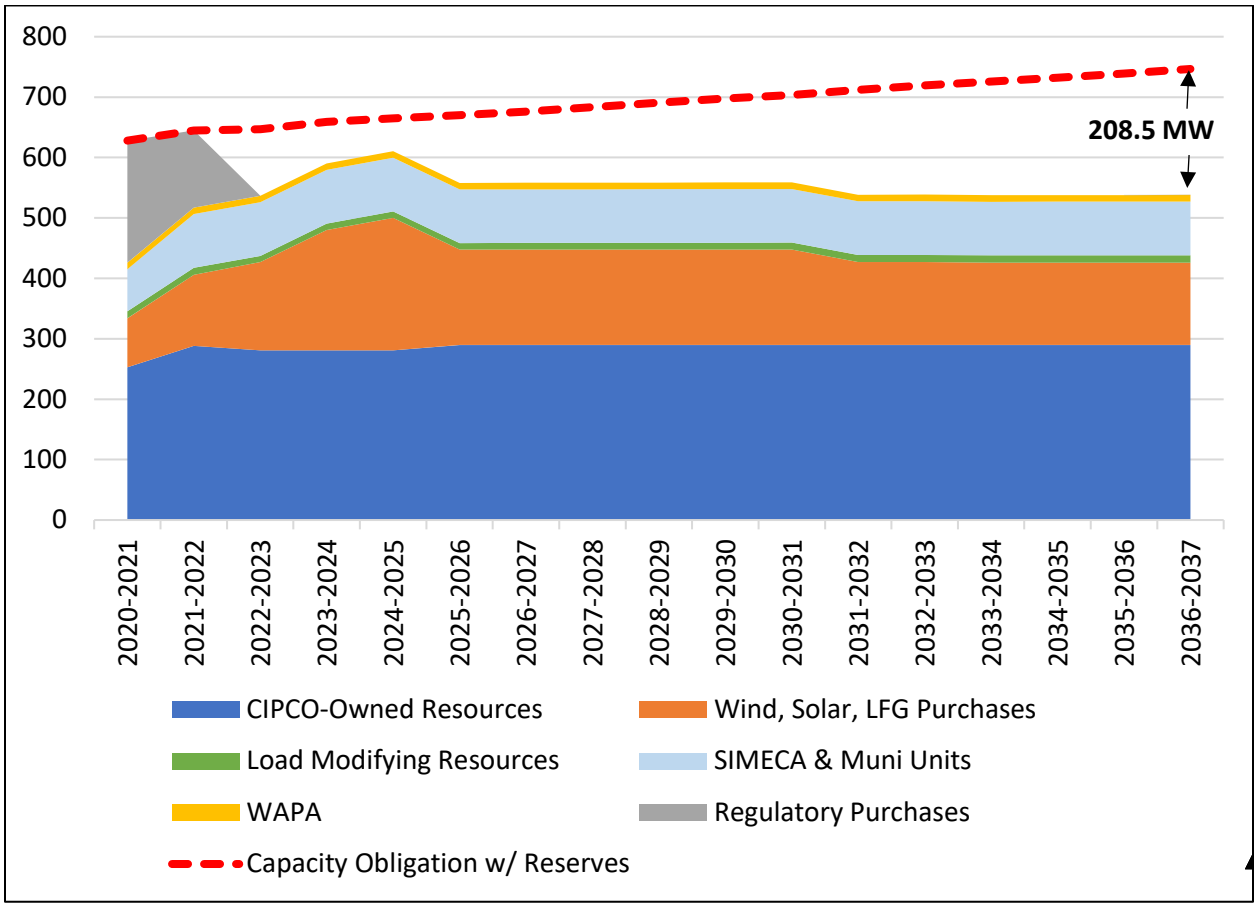


Table 4 – CIPCO Resource Adequacy BEFORE New Resources (MW)

CIPCO Resource Adequacy - BEFORE NEW RESOURCES

Planning Year [1]	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030	2030-2031	2031-2032	2032-2033	2033-2034	2034-2035	2035-2036	2036-2037
Requirement (MW Values)																	
CIPCO Total Demand w/o losses	603.6	620.3	624.0	635.4	641.8	648.0	655.0	662.7	670.8	678.0	684.4	691.2	698.3	704.8	710.9	717.5	724.8
Diversity with MISO, MW	50.1	51.3	51.6	52.6	53.1	53.6	54.2	54.8	55.5	56.1	56.6	57.2	57.8	58.3	58.8	59.4	60.0
Coincident Demand w/o losses	553.5	569	572.4	582.8	588.7	594.4	600.8	607.9	615.3	621.9	627.8	634	640.5	646.5	652.1	658.1	664.8
MISO Estimated Transmission Losses, MW	23.2	20.5	19.5	19.9	20.1	20.4	20.6	20.8	21.0	21.2	21.4	21.6	21.9	22.0	22.2	22.5	22.7
Coincident Demand w/MISO Losses	576.7	589.5	591.9	602.7	608.8	614.8	621.4	628.7	636.3	643.1	649.2	655.6	662.4	668.5	674.3	680.6	687.5
MISO Module E-1 Reserves	51.3	55.4	55.0	56.1	56.0	55.3	54.7	54.7	54.7	54.7	54.5	56.4	57.0	57.5	58.0	58.5	59.1
Planning Reserve Margin Requirement	**628.0**	**644.9**	**646.9**	**658.8**	**664.8**	**670.1**	**676.1**	**683.4**	**691.0**	**697.8**	**703.7**	**712.0**	**719.4**	**726.0**	**732.3**	**739.1**	**746.6**
Capability (UCAP values)																	
Total Coal ZRCs	182.8	184.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3
New DG Recip Engines										0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Natural Gas ZRCs	70.1	103.9	97.4	97.4	97.4	106.3	106.3	106.3	106.3	106.3	106.3	106.3	106.3	106.3	106.3	106.3	106.3
Total Diesel ZRCs	69.6	88.7	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8
Wind ZRCs	76.0	62.7	71.0	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3
Landfill ZRCs	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.0	0.0	0.0	0.0
Solar-Addition												0.0	0.0	0.0	0.0	0.0	0.0
Solar ZRCs	4.0	54.0	74.0	124.0	144.0	82.6	82.6	82.6	82.6	82.6	82.6	62.0	62.0	62.0	62.0	62.0	62.0
Total Wind/Solar/Landfill ZRCs	81.1	117.8	146.1	199.4	219.4	158.0	158.0	158.0	158.0	158.0	158.0	137.4	137.4	136.3	136.3	136.3	136.3
REGULATORY CAPACITY TRANSACTIONS																	
Regulatory Capacity Purchase ZRCs	201.9	127.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EXTERNAL RESOURCES																	
External Resource: WAPA	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
DEMAND RESOURCES																	
Load Modifying Resources	11.6	11.7	10.4	10.6	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.8	11.9	12.1	12.2	12.4	12.5
Net ZRCs [3]	**628.0**	**644.9**	**536.9**	**590.4**	**610.5**	**558.1**	**558.3**	**558.4**	**558.6**	**558.7**	**558.9**	**538.5**	**538.6**	**537.7**	**537.8**	**538.0**	**538.1**
Final CIPCO Surplus/(Deficit)	0.0	0.0	-110.0	-68.4	-54.3	-112.0	-117.8	-125.0	-132.4	-139.1	-144.8	-173.5	-180.8	-188.3	-194.5	-201.1	-208.5

NOTES:

[1] The MISO planning year runs from June through May.

[3] ZRC is the zonal resource credit for MISO Module E-1. One MW is equivalent to one ZRC.

Chapter 4: Demand-Side Resource Options

DSM Objectives

CIPCO currently has a robust set of demand-side management (DSM) programs available to the retail consumers of its member systems, as summarized in Chapter 2. These programs offer information and incentives to help member-consumers lower their energy bills and reduce the overall amount of energy used within the CIPCO service area.

The DSM programs are designed to provide benefits to the CIPCO system exceeding the costs of implementing and offering those programs, from a societal perspective (total resource cost plus the assumed cost of externalities). The financial benefits of the energy and peak demand savings are compared to CIPCO's avoided cost of new generation or incremental supply-side resource acquisition. DSM measures and programs are added to CIPCO's resource portfolio if they can be offered and maintained for less than CIPCO's avoided energy and demand costs and are feasible from a technical, economic, and market perspective. Measures and programs that are more expensive than CIPCO's avoided costs or are in other ways infeasible are typically not offered, except for pilot testing purposes. Programs or specific measures that are not currently cost-effective may be implemented in the future if CIPCO's avoided costs increase above that of the program's projected expense and/or if the cost of the measures decline to a level at which they become cost effective. Existing measures may be dropped from programs if they have been displaced by superior equipment options or if the technology has reached market penetration levels that indicate that a market transformation has taken place.

Since the 1990s, CIPCO has conducted a comprehensive evaluation of DSM measures, programs, and delivery mechanisms on a regular basis. The DSM objectives and planning criteria are coordinated across the CIPCO system using a common set of methodologies and assumptions. The criteria and structure remain consistent with the 2015-2019 Energy Efficiency Plan although the formal planning process is no longer required for cooperative utilities in Iowa. CIPCO's current DSM plans are designed to meet its energy-efficiency goals to capture cost-effective energy efficiency and beneficial electrification impacts for its membership.

Evaluation Criteria

DSM measures and programs are evaluated from multiple perspectives using the following benefit-cost tests. These definitions are from the Iowa Administrative Code and industry best practices, and have been used to guide CIPCO's cost-effectiveness testing as its programs have evolved:

Societal test means an economic test used to compare the present value of the benefits to the present value of the costs over the useful life of an energy-efficiency measure or program from a societal perspective. Present values are typically calculated using a 12-month average of the 10-year and 30-year Treasury bond rate as the discount rate, although alternate discount rate measures may be considered. Benefits are the sum of the present values of the utility avoided supply and energy costs including the effects of externalities (using a 10 percent externality adder, per Iowa code). Costs are the sum of the present values of utility program costs (excluding consumer incentives), participant costs, and any increased utility supply costs for each year of the useful life of the measure or program.

Utility cost test means an economic test used to compare the present value of the benefits to the present value of the costs over the useful life of an energy-efficiency measure or program from the utility revenue requirement perspective. Present values are calculated using the utility's discount rate. Benefits are the sum of the present values of each year's utility avoided capacity and energy costs (excluding the externality factor) over the useful life of the measure or program. Costs are the sum of the present values of the utility's program costs, consumer incentives, and any increased utility supply costs for each year of the useful life of the measure or program. The typical cooperative ownership and organizational structure divides generation and transmission functions from retail sales of electricity with all-requirements contracts and wholesale rates connecting the two parties.

Participant test means an economic test used to compare the present value of benefits to the present value of costs over the useful life of an energy-efficiency measure or program from the participant's perspective. Present values are calculated using a discount rate appropriate to the class of consumer to which the energy-efficiency measure or program is targeted. Benefits are the sum of the present values of the consumer's bill reductions, avoided incremental equipment purchase costs, tax credits, and consumer incentives for each year of the useful life of an energy efficient measure or program. Costs are the sum of present values of the consumer participation costs (including initial capital costs, ongoing operations and maintenance costs, removal costs less a salvage value of existing equipment, and the value of the consumer's time in arranging installation, if significant) and any resulting bill increases for each year of the useful life of the measure or program. The calculation of bill increases and decreases accounts for any time-differentiated rates to the consumer or customer-class being analyzed.

Ratepayer impact measure test means an economic test used to compare the present value of the benefits to the present value of the costs over the useful life of an energy-efficiency measure or program from a rate level or utility bill perspective. Present values are calculated using the utility's discount rate. Benefits are the sum of the present values of utility avoided capacity and energy costs (excluding the externality factor) and any revenue gains due to the energy-efficiency measures for each year of the useful life of the measure or program. Costs are the sum of the present values of utility increased supply costs, revenue losses due to the energy-efficiency measures, utility program costs, and consumer incentives for each year of the useful life of the measure or program.

CIPCO and its member systems considered these tests to determine the cost-effectiveness of specific programs and to assure an equitable sharing of net benefits without excessive negative influences on any constituency. Additional discussion of the evaluation criteria and strategy can be found in the five-year Energy Efficiency Plan filed by Iowa's electric cooperatives in 2014[9]. As noted previously, cooperative utilities in Iowa are no longer required to file energy efficiency plans. However, most of CIPCO's current programs were included in its 2015-2019 planning process and the metrics upon which they were evaluated and selected remain relevant for its current programs.

[9] Iowa Association of Electric Cooperatives, "Electric Cooperatives' Joint Energy Efficiency Plan 2015-2019", December 31, 2014.

CIPCO uses additional criteria beyond aggregate net benefits to evaluate DSM measures including:

- Load shape
- Participation factor
- Magnitude and duration of energy and demand impacts
- Public perception issues
- Availability of products and services
- Availability of delivery channel partners
- Marketing impediments
- Program costs and budget impacts

In addition to those criteria, consideration is given to particular measures and broader programs designed to deliver a set of measures, including:

- Key consumer characteristics that influence acceptance and response to targeted programs such as demographics, income, awareness, motivation, price, and up-front capital costs
- Local conditions and other unique characteristics for a particular region or service territory
- External variables such as economic conditions, energy prices, alternative technologies, regulation, and tax credits that also influence consumers' decisions
- Utility considerations such as the load shape changes and their impacts on generation resource requirements, transmission, and distribution system resources
- Local community or individual member cooperative considerations that may enhance or deter the promotion and delivery of specific programs

CIPCO and its member systems monitor and refine their DSM programs and delivery mechanisms on an ongoing basis to help improve the overall effectiveness of their programs. CIPCO holds several meetings a year where employees from the member cooperatives discuss local issues related to DSM programs offered by CIPCO. Based on these discussions and as changes are made to federal energy-efficiency standards, CIPCO and its members re-evaluate programs and make adjustments with the intent to improve their implementation and effectiveness.

The CIPCO membership recently made structural changes in its energy efficiency and beneficial electrification programs to facilitate voluntary participation by member systems. Any member system choosing to implement programs independently can continue to offer many of the same programs as are currently being offered and will provide participation and impact estimates to CIPCO for planning purposes. This evaluation assumes a continuation of programs in their current form and under current goals until any changes are formally adopted.

CIPCO DSM Planning

CIPCO's current DSM strategy and goals continue to be guided by formal DSM plans that were required until 2018, although a handful of modifications have been made in response to new energy efficiency standards and the widespread adoption of some technologies. CIPCO's 2015-2019 Energy Efficiency Plan, filed with the IUB and publicly available as previously cited, includes detailed program and measure evaluations and the implementation strategy that continues to be followed. CIPCO's current DSM plan includes the programs discussed in Chapter 2 of this report.

CIPCO's energy-efficiency goals included in this resource plan have been updated through 2026 for the IRP analysis and system planning purposes. Detailed energy impact estimates for each DSM program across the CIPCO system over the 2022 to 2026 period are included in Table 5 (before system losses) and are illustrated in Figure 10. The estimates include the number of new participants by program and the cumulative energy impacts for each year, including impacts for measures impacted by fuel choice of electric appliances over alternate fuels. Fuel choice of high-efficiency heat pumps contributes to increases in winter electricity consumption and peak demand but decreases in summer consumption and peak demand and overall energy consumption (of all fuels, on a BTU basis). The cumulative energy impacts also adjust for the expected life of previously-installed measures to capture the duration of those impacts, realizing that some measures installed in previous years and decades have reached the end of their natural life and are removed from the cumulative impacts upon retirement to avoid double-counting the impacts of new and previously-installed measures.

Since CIPCO is a summer-peaking utility, the summer peak demand is the primary driver of new resource requirements and is therefore a key focus of DSM impacts. CIPCO's DSM programs have reduced its summer peak demand by nearly 25 MW, providing a cost-effective resource to the system. As noted previously, high-efficiency home indoor lighting programs have been phased out as new federal energy-efficiency standards require the use of lighting products that were previously promoted through DSM programs and incentives. This results in some decline in the summer peak demand impacts directly attributable to CIPCO's DSM program incentives, although the market transformation in lighting provides permanent load changes with a higher level of energy efficiency.

Table 5 – DSM Program Participation and Impacts 2022-2026

	New Participants - CIPCO					Cumulative MWh Impacts - CIPCO				
Residential Programs	**2022**	**2023**	**2024**	**2025**	**2026**	**2022**	**2023**	**2024**	**2025**	**2026**
Heat Plus	22	22	22	22	22	12,667	12,853	12,544	11,684	10,836
Dual Fuel	0	0	0	0	0	734	0	0	0	0
Interruptible	0	0	0	0	0	70	0	0	0	0
Air Source Heat Pumps	400	420	440	460	480	30,805	31,733	32,428	32,819	33,084
Geothermal Heat Pumps	435	466	572	788	734	35,877	34,861	33,498	31,612	29,684
Conventional Water Heater	0	0	0	0	0	0	0	0	0	0
Premium Quality Water Heater	800	800	800	800	800	2,719	1,852	1,616	1,578	1,549
Drain Water Recovery Pipe	0	0	0	0	0	(5)	(5)	(5)	(5)	(5)
Heat Pump Water Heater	125	125	125	125	125	(3,520)	(3,733)	(3,926)	(4,081)	(4,113)
All Electric Home	34	34	34	34	34	(278)	(292)	(306)	(319)	(333)
Indoor Air Quality	0	0	0	0	0	0	0	0	0	0
Heat Recovery Ventilation	95	92	99	87	103	(373)	(392)	(411)	(429)	(447)
Central Air Conditioners	842	840	838	835	833	(5,094)	(5,039)	(4,976)	(5,035)	(5,215)
Energy Star Clothes Washer	190	190	190	190	190	(2,149)	(1,978)	(1,820)	(1,625)	(1,335)
Energy Star Dishwasher	0	0	0	0	0	(657)	(526)	(385)	(280)	(219)
Energy Star Refrigerator	0	0	0	0	0	(567)	(509)	(447)	(375)	(285)
Freezer	0	0	0	0	0	(85)	(85)	(85)	(78)	(62)
Dehumidifier	0	0	0	0	0	(106)	(106)	(106)	(93)	(68)
Efficient Television	0	0	0	0	0	(319)	(319)	(319)	(309)	(265)
Electronic Recycling	1,034	1,045	1,055	1,066	1,076	(1,735)	(1,518)	(1,391)	(1,308)	(1,261)
Residential Indoor Lighting (# bulbs)	0	0	0	0	0	(6,279)	(3,003)	(1,627)	(974)	(161)
Outdoor Security Lighting	2,500	2,500	2,500	2,500	2,500	(7,250)	(7,538)	(7,790)	(8,026)	(8,310)
E-Star Window Air Conditioner	0	0	0	0	0	(25)	(19)	(11)	(5)	(1)
Low Flow Aerators	0	0	0	0	0	(111)	(75)	(65)	(50)	(37)
Low Flow Showerheads	0	0	0	0	0	(680)	(586)	(559)	(527)	(463)
WH Tank and Pipe Insulation	0	0	0	0	0	(14)	(9)	(5)	(2)	0
Residential Weatherization	90	90	90	90	90	(7,142)	(7,188)	(7,233)	(7,279)	(7,324)
Window Air Conditioner	0	0	0	0	0	0	0	0	0	0
Storage Water Heating	0	0	0	0	0	0	0	0	0	0
ETS Space Heating	0	0	0	0	0	0	0	0	0	0
Residential Total						46,483	48,379	48,621	46,893	45,249
Commercial & Ag. Programs										
Comm'l Air Source Heat Pumps	53	53	53	53	53	1,241	1,175	1,061	999	953
Comm'l Geothermal Heat Pumps	418	513	392	426	715	1,923	1,783	1,675	1,590	1,439
Comm'l Heat Recovery Ventilation	58	67	61	58	59	(761)	(831)	(904)	(972)	(1,038)
Premium Motors	0	0	0	0	0	(19)	(19)	(18)	(17)	(16)
Variable Speed Drives	118	10	9	7	6	(7,079)	(8,167)	(8,133)	(7,912)	(7,628)
Comm'l Indoor Lighting (#bulbs)	150	150	150	150	150	(40,626)	(40,062)	(39,474)	(37,680)	(34,906)
Dairy Pre-Cooler	8	8	8	8	8	(651)	(650)	(668)	(666)	(664)
Livestock Ventilation Fans	407	407	407	407	407	(860)	(1,036)	(1,200)	(1,364)	(1,538)
Livestock Circulation Fans	0	0	0	0	0	(153)	(153)	(153)	(152)	(151)
Livestock Equipment	150	150	150	150	150	(1,113)	(1,206)	(1,298)	(1,391)	(1,483)
Custom C&I	2	2	2	2	2	(25,481)	(25,680)	(25,725)	(25,654)	(25,424)
Comm'l & Ag. Total						(73,579)	(74,847)	(74,838)	(73,218)	(70,455)

Cumulative electric energy impacts in the residential class have historically been positive (electric load growth) due to the impact of fuel switching away from non-electric fuel choices to efficient electric heat pumps and water heating. The continued promotion of beneficial electrification and fuel switching away from fossil fuels will likely continue this trend in the future. It should be noted that heat pumps included in this program may increase winter electricity consumption but should decrease summer consumption compared to standard central air conditioning equipment.

The cumulative impacts of all business and agriculture DSM programs tended to be smaller than residential programs until 2010. After 2010, an increased focus was placed on electricity consumption reductions in both the residential and business sectors, including expansions of business and agriculture programs and more aggressive energy savings goals.

In addition to DSM programs, CIPCO maintains an interruptible program for large C&I customers. There were 16 consumer-members on its Schedule A-2 interruptible rate in 2020. The total potential interruptible load at the time of CIPCO's 2020 annual peak demand was approximately 10 MW. Three existing loads will be leaving the A-2 program in 2022, removing about 1 MW of total load available for reduction. CIPCO continues to pursue opportunities for interruptible contracts with existing or new large consumers, but future participation levels are uncertain and only modest future growth is expected.

Long-Term DSM Plan

Development of long-term load forecasts and resource plans requires an extended forecast of DSM impacts. For analysis purposes, CIPCO's current DSM goals will continue to guide its program offerings for the foreseeable future. In reality, the DSM program offerings may change as a result of program evaluation, updated avoided costs, expanding government regulations and energy-efficiency standards, technology advancements, and other new information. As noted previously, the structure of CIPCO's DSM programs and participation by member systems is currently under review and changes may be implemented but are uncertain at this time and not incorporated into this evaluation.

Consistent with CIPCO's 2021 load forecast, the estimated cumulative impacts of historic and future DSM programs are integrated into the load forecasts that were presented in Chapter 3. The "base-case" load forecast includes the projected impacts of DSM programs over the load forecast and IRP horizon.

The estimated DSM impacts on CIPCO's total energy requirements are summarized in Figure 10, including approximately 8.0 percent for distribution and transmission system losses beyond the estimated impacts at the retail meter. The impacts of DSM programs on CIPCO's seasonal peak demands are also estimated on a program basis and are aggregated to the CIPCO level across programs. CIPCO's DSM strategy focuses on the summer peak demand since it typically drives the CIPCO system peak demand and the annual MISO peak demand. The estimated summer peak DSM savings impact remains in the 20 to 25 MW range in the near term, as illustrated in Figure 11, before gradually declining primarily due to the reduction in lighting impacts directly attributable to active DSM programs due to the market transformation in lighting and retirement of previously-installed measures.

Since CIPCO has been marketing energy-efficient equipment for several decades, it has an established database of measure installations, estimated impacts, and the anticipated lifetime of those measures. As those measures are retired (reach their anticipated lifetime), the impacts of those measures are removed from the cumulative DSM impact estimates used for planning purposes. In this manner, the measure impacts are included in a plausible and discreet time period and are not double-counted with new measures being installed to replace retired measures. The impacts of measure retirements and new measure installation are evident in the long-term DSM impact estimates presented in this section.

Figure 10 – DSM Cumulative Energy Impacts (MWh)

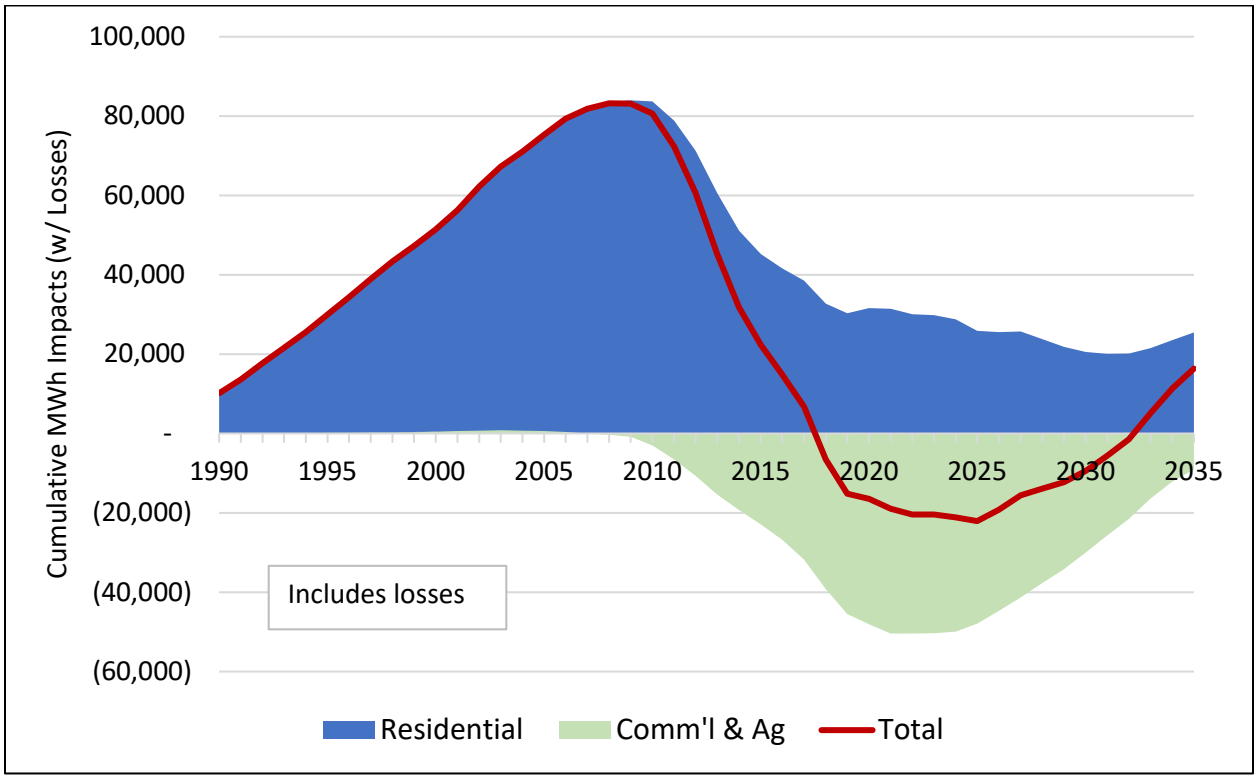
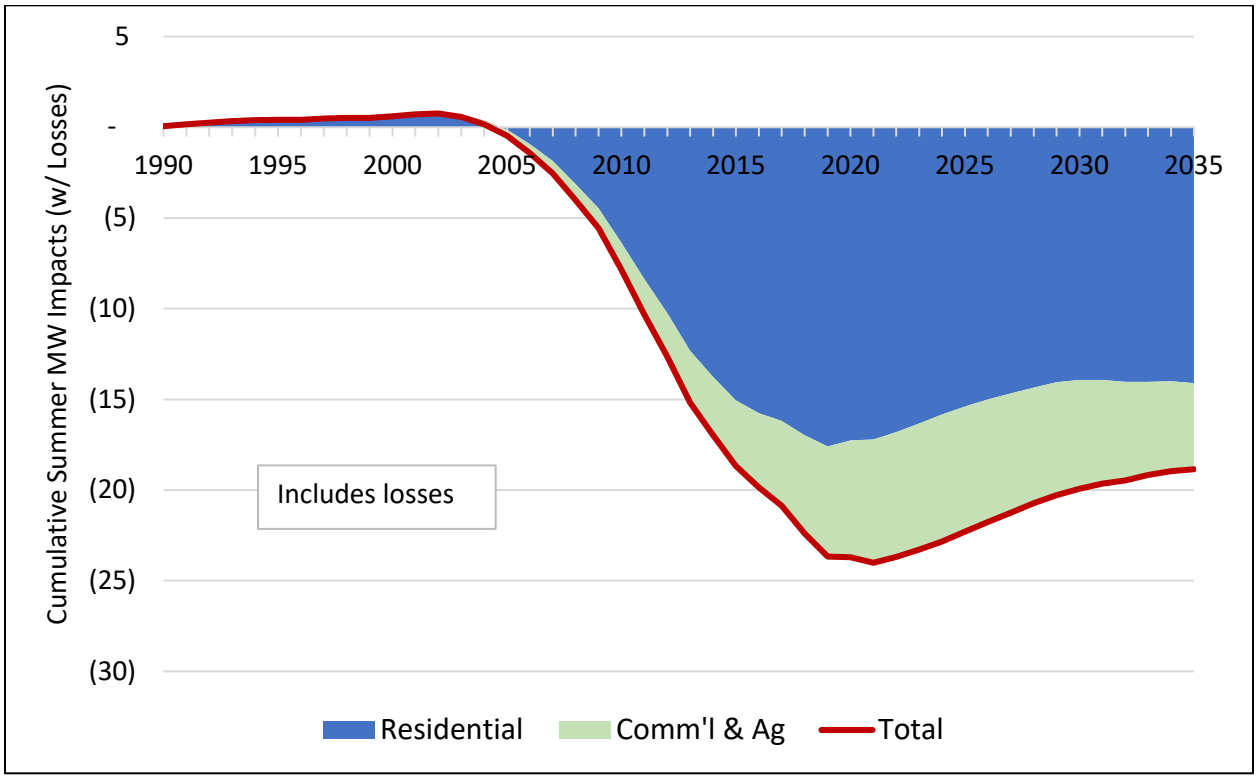


Figure 11 – DSM Cumulative Summer Peak Impacts (MW)



Verification and Durability

CIPCO has an established monitoring and verification process to ensure the installation and effectiveness of DSM measures. This process includes consumer surveys that accompany rebates provided to participants and ongoing appliance (end-use) surveys to update the current stock of appliances and to track changes over time. CIPCO uses the survey information to adjust assumptions in its DSM planning and evaluations, including assumptions about alternate fuel choices, uninstalled equipment, free ridership, and other factors that affect the impact of DSM measures.

Chapter 5: Supply-Side Resource Options

CIPCO's existing owned generation resources and long-term power purchase contracts currently meet the majority of the CIPCO system's needs. The remaining portions of energy and demand requirements are met through a combination of short-term contracts and wholesale market power purchases. CIPCO maintains a strategic long-term guideline to meet a minimum of 80 percent of its regulatory capacity requirements with owned resources and long-term PPAs and not to exceed five percent of purchases outside of MISO Load Resource Zone 3. CIPCO's current plan is within those thresholds.

Options to meet the future needs of the CIPCO system include one or a combination of the following:

- Expand DSM programs to reduce power needs, as discussed in the previous section
- Construct or partner in development of new generation resources
- Purchase supplemental capacity and/or energy resources through wholesale contracts

New Generation Options

CIPCO continually monitors its need for additional resources and the opportunities available within the regional wholesale power market. CIPCO's decision to pursue or not pursue specific new generation options will depend on a variety of factors, including:

- Its need for future resources and its load/resource balance relative to market exposure and risks
- The advantages of fuel diversity
- The expressed desire for wind and solar resources among the membership and Board of Directors
- The ownership and partnership structures available
- The credit worthiness and ratings of the entities involved
- Technical and price risks with different technologies or fuels (e.g. dispatchable vs. intermittent)
- The expected cost of generation over the life of the plant
- Available opportunities in the region for a particular resource
- Financing, regulatory, and environmental compliance risks
- The length of the project development, design, and construction periods
- Transmission interconnection, network upgrade risks, and transmission congestion

The capital, operating, maintenance, and fuel costs of each resource option will depend on the particulars of a specific resource, the technologies used, fuel availability and price, capital market conditions, environmental attributes of the specific location, and any other advantages or disadvantages with a specific resource option. CIPCO monitors and evaluates options as they become available and seeks additional information where specific options are not readily available for evaluation.

The U.S. Department of Energy (DOE) develops an Annual Energy Outlook (AEO) to comprehensively evaluate and forecast several metrics of the energy industry over a long-term horizon. As part of the AEO analysis, the DOE estimates current and future costs of new power generation on a lifecycle basis.

This provides a credible benchmark with which to begin evaluations of future resource additions. Estimated levelized costs of new generation are summarized in Figure 12 and in Table 6.

Figure 12 – Projected Levelized Cost for New Generation

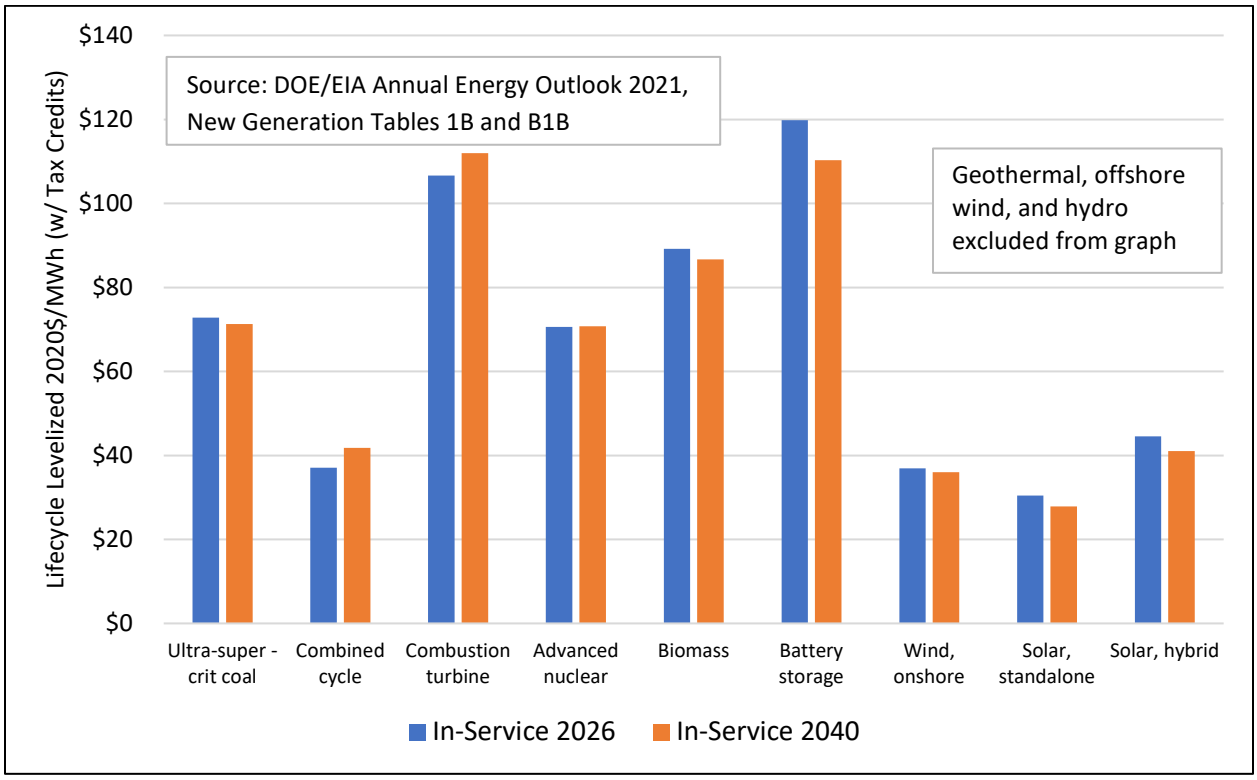


Table 6 – Levelized Cost for New Generation Resources in 2026

Estimated unweighted levelized cost of electricity (LCOE) for new resources entering service in 2026 (2020 $/MWh)								
Plant type	**Capacity factor (percent)**	**Levelized capital cost**	**Levelized fixed O&M**	**Levelized variable cost**	**Levelized transmis-sion cost**	**Total system LCOE**	**Levelized tax credit**	**Total LCOE w/ tax credit**
Dispatchable technologies								
Ultra-supercritical coal	85%	$43.80	$5.48	$22.48	$1.03	$72.78	NA	$72.78
Combined cycle	87%	$7.78	$1.61	$26.68	$1.04	$37.11	NA	$37.11
Combustion turbine	10%	$45.41	$8.03	$44.13	$9.05	$106.62	NA	$106.62
Advanced nuclear	90%	$50.51	$15.51	$9.87	$0.99	$76.88	($6.29)	$70.59
Geothermal	90%	$19.03	$14.92	$1.17	$1.28	$36.40	($1.90)	$34.49
Biomass	83%	$34.96	$17.38	$35.78	$1.09	$89.21	NA	$89.21
Battery storage	10%	$57.98	$28.48	$23.85	$9.53	$119.84	NA	$119.84
Non-dispatchable technologies								
Wind, onshore	41%	$27.01	$7.47	$0.00	$2.44	$36.93	NA	$36.93
Wind, offshore	44%	$89.20	$28.96	$0.00	$2.35	$120.52	NA	$120.52
Solar, standalone (1-axis)	29%	$23.52	$6.07	$0.00	$3.19	$32.78	($2.35)	$30.43
Solar, hybrid (4-hour)	28%	$31.13	$13.25	$0.00	$3.29	$47.67	($3.11)	$44.56
Hydroelectric	55%	$38.62	$11.23	$3.58	$1.84	$55.26	NA	$55.26

Notes:
Represents a U.S. unweighted average, not specific to Iowa
The tax credit component is based on targeted federal tax credits such as the production tax credit (PTC) or investment tax credit (ITC) available for some technologies, reflecting current phaseout timelines.

The AEO separates its comparisons into dispatchable and non-dispatchable resources, including a solar hybrid option with four hours of battery storage. The 2021 AEO indicates that the levelized cost of a combined-cycle gas turbine is approximately one-half the price of an ultra-supercritical coal plant. The levelized cost of advanced nuclear is comparable to coal but is more expensive than combined-cycle gas units on a levelized cost basis given current capital and fuel cost assumptions. It should be noted that fuel costs have changed since the 2021 AEO was developed, with a much higher price of natural gas since mid-2021. It is expected that the 2022 AEO (scheduled for release in March 2022) will have higher levelized costs for gas-fired generation than the 2021 AEO figures cited here, although the magnitude of any change is uncertain at this time.

Among non-dispatchable power options, the cost of stand-alone solar is somewhat lower than on-shore wind, although this represents an unweighted U.S. average of installations, not the wind and solar profiles in Iowa which would likely reflect a lower cost for wind. Including current tax incentives, the levelized energy costs of standalone solar and wind are comparable to a combined-cycle gas unit, although solar and wind are intermittent resources. An option for solar with a four-hour storage system provides an amount of dispatchability but increases costs to slightly higher than combined-cycle gas plant using the 2021 AEO assumptions. CIPCO continues to monitor the costs and benefits of battery storage in conjunction with specific resource additions.

It should be noted that Iowa has some of the best wind resources in the United States, while it has relatively average solar resource potential compared to the U.S. average. Although the levelized costs of

geothermal and hydro utility-scale generation is comparable to the cost of natural gas generation, Iowa has no available large hydro or geothermal opportunities. Iowa does have ample biomass resource potential should the prices become more favorable than provided in the 2021 AEO expectations.

These are general assumptions across the U.S. used for comparative and illustrative purposes, and are not specific to the CIPCO system or any options currently being evaluated.

New Coal Plant Options

Coal comprised approximately one-third of CIPCO's sources of energy in 2021, but that share will decline in the future as non-coal resources are added to CIPCO's generation portfolio. CIPCO's last coal resource addition was the acquisition of partial ownership of the Walter Scott Jr. #4 unit near Council Bluffs, operated by MidAmerican Energy. CIPCO initially acquired 73 MW of capacity upon plant completion in 2007 and purchased an additional four MW in 2011.

Over the past five years, the significantly lower price of natural gas and renewable resources have made the cost to run some existing, large coal power plants uncompetitive in the regional power market and has driven the retirement of many smaller, older, and less efficient coal units. As discussed previously, the marginal cost of production from new natural gas-fired generation is much lower than for new coal plants partially due to the greater capital cost for coal plant construction, current fuel price projections, and emissions abatement requirements and environmental compliance costs associated with coal generation. Although the higher price of natural gas during the last half of 2021 has made coal power plants relatively more competitive, this price increase is expected to be temporary.

Due to the combination of these factors plus the potential for carbon taxes or emissions regulations, development of any new coal generation resources in the region is unlikely in the foreseeable future. Although CIPCO will continue to monitor the market for next-generation coal plants or for low-cost ownership options for existing plants, it has no firm plans to pursue additional coal generation resources within the 15-year IRP horizon.

New Nuclear Plant Options

The Next Era Energy Duane Arnold nuclear plant provided approximately one-third of the CIPCO system's energy and over 20 percent of the capacity required until its retirement in August 2020. This carbon-free and emission-free resource was a key part of CIPCO's strategic goal to balance fuel supply and mitigate emissions, although its operating costs were relatively high while the costs of renewable generation and natural gas declined dramatically in recent years. The combination of these factors and damage from the "derecho" storm in August 2020 resulted in the plant's closure.

CIPCO continues to monitor the development of advanced nuclear power plants in the United States. However, there are no firm plans for new nuclear plant construction in the Midwest at this time and none are likely in the foreseeable future. CIPCO is prepared to evaluate the merits of new nuclear generation, should it be proposed. Since new nuclear plants take eight to ten years to plan, design, approve, and construct, it is unlikely that any new nuclear capacity would be added in this region until near the end of this 15-year IRP horizon.

New Natural Gas Plant Options

CIPCO's Summit Lake Plant finished a construction project in 2021 where three steam turbines were retired and three reciprocating gas engines were added. The plant provided 104 MW of regulatory capacity for the 2021-2022 planning year to the CIPCO system and is its only gas-fired, central-station generation plant. As a peaking plant, Summit Lake comprises a substantial portion of CIPCO's regulatory capacity but only a small share of CIPCO's overall energy needs.

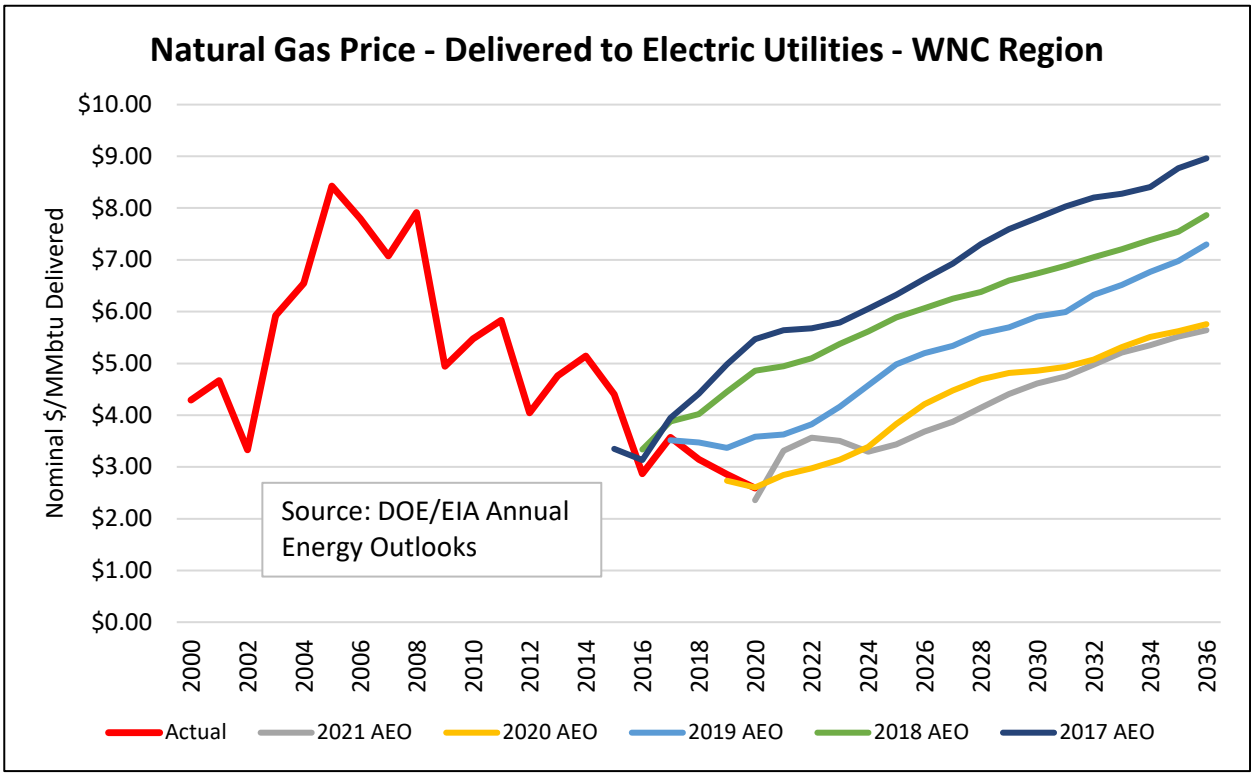
Natural gas has substantial environmental benefits compared to coal. Natural gas plants do not emit mercury, SO_2, or particulates to any great extent and have lower emissions of NO_X, CO, and CO_2 per unit of energy generated compared to coal generation. There are no ash disposal or coal dust issues with generation or fuel transportation, although the natural gas combustion and transmission process may allow small amounts of methane, a potent greenhouse gas, to escape.

In addition, natural gas plants have the advantage of typically being planned, designed, approved, and constructed in three to five years. This is much shorter than the typical coal or nuclear power plant and allows greater planning flexibility while reducing the financial risks of longer construction cycles.

Advances in natural gas recovery techniques, particularly in hydraulic fracturing (aka "fracking") have resulted in vast quantities of previously unrecoverable natural gas resources being available for extraction in a cost-effective manner. The combination of substantial supply increases, continued production efficiencies, and the substantial capital invested in fracking infrastructure over the last decade have caused natural gas prices to remain low over the past decade, aside from the increase in 2021 which is partially weather driven and is expected to be temporary.

The 2021 and previous AEO forecasts for natural gas prices delivered to electric generators in the West North Central (WNC) census region are illustrated in Figure 13. The projected price of natural gas has fallen substantially over the past decade due to higher production and storage levels. Although natural gas prices increased in 2021, exceeding $4.00/MMBtu at the Henry Hub for much of the second half of the year, prices are projected to moderate somewhat over the next few years. The most recent DOE Short-Term Energy Outlook (STEO) forecast reflects Henry Hub natural gas prices returning to below $4.00/MMBtu in 2022 and 2023, but not returning to the lower levels experienced over the 2016 to 2020 period. The prices in Figure 13 are in nominal dollars for comparative purposes.

Figure 13 – Natural Gas Price Delivered to Electric Utilities – WNC Region



As noted previously, new natural gas combined-cycle plants have a significant cost advantage over new coal or nuclear plants for baseload or intermediate power needs. In addition to the cost advantages, gas-fired plants have superior load-following capabilities compared to coal or nuclear, and therefore complement CIPCO's portfolio of intermittent wind and solar resources.

For these reasons plus fuel diversity, CIPCO continues to monitor the regional market for opportunities to expand its natural gas generation portfolio including reciprocating or simple-cycle, gas-fired units. These flexible and efficient units typically have limited run times and provide regulatory capacity and supplemental power at a reduced capital cost compared to a larger unit. An additional advantage is the ability to disperse these units geographically, potentially improving system reliability and reducing the need for transmission and distribution system upgrades. Adding capacity in small increments also allows CIPCO to increase supply in proportion to load growth and smooth costs over time.

CIPCO's current financial plan includes the addition of approximately 64 MW of regulatory capacity from geographically-dispersed natural gas generation in the 2029 to 2032 period. CIPCO will continue to monitor load growth and its resource needs, and retains the flexibility to alter the timing or magnitude of this investment.

Cogeneration and District Heating and Cooling Options

Cogeneration and district heating provide substantial additional efficiencies by using "waste" heat (steam) from power production to heat or cool buildings. The heating or cooling fuel is essentially free

(on an incremental basis), although infrastructure must be added to capture waste heat from the plant and distribute the heating or cooling capacity to buildings or processes.

Although cogeneration provides substantial energy efficiencies, its applications are limited due to geography and limited partnership opportunities between utilities and host facilities (the users of the heating or cooling capacity). A cogeneration power plant needs to be located in close proximity to the steam host, an equitable cost sharing plan needs to be negotiated, and the economic viability of both the power plant and the steam host needs to be ensured over an extended period.

CIPCO has robust information about the large commercial and industrial customers on its system through its load forecasting and customer relations processes and will continue to monitor opportunities to realize the joint benefits of cogeneration in the future. However, no cogeneration opportunities are currently available nor under formal consideration at this time.

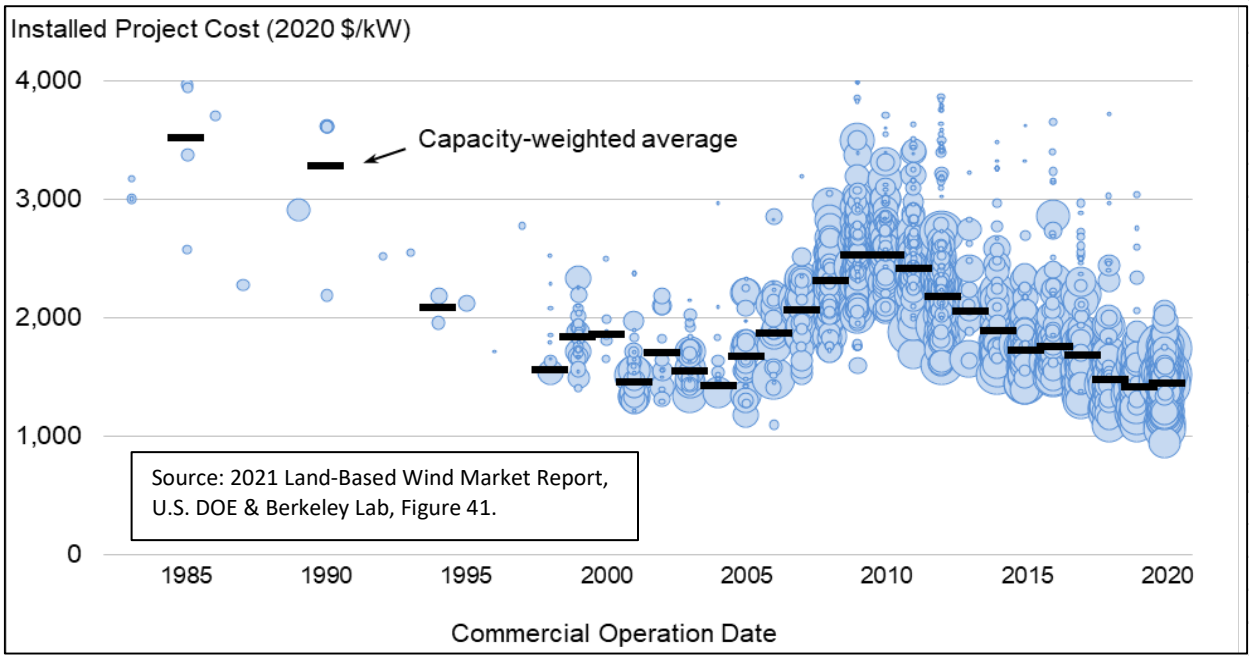
New Renewable Power Options

CIPCO has made substantial investments and acquisitions of wind and solar power over the past decade, with the pace of acquisitions increasing in recent years to replace power from the DAEC nuclear plant. Air emissions from wind and solar generation are zero, making them among the most environmentally benign sources of power. Landfill gas burns methane, a potent greenhouse gas, although emissions of NO_X and CO_2 remain. Biomass generation avoids the SO_2 and mercury emissions of coal, and produces little or no net CO_2 emissions, but it emits particulates and requires ash disposal.

The price of wind and solar power have declined significantly in recent years and have been the primary sources of CIPCO's recent power supply acquisitions. Given Iowa's strong wind portfolio and continued development of larger, utility-scale solar projects, wind and solar are likely to be the primary focus of future resource acquisitions. For this reason, wind and solar are discussed more extensively than landfill gas and biomass options in this report.

The installed cost of large-scale wind power has been declining over the past decade and has remained in the $1,500/kW range for projects entering service in recent years (U.S. average). While this price can vary widely by size and location, Iowa has a well-developed wind industry and larger wind farms that capture economies of scale and help reduce installed costs, and thus Iowa wind prices tend to be below the U.S. average. Trends of wind power project costs in the U.S. are illustrated in Figure 14. The decline in installed cost is based on larger-scale manufacturing, larger turbines that capture increased economies of scale, and increasing efficiency in site design and installation.

Figure 14 – Installed Cost of U.S. Wind Power

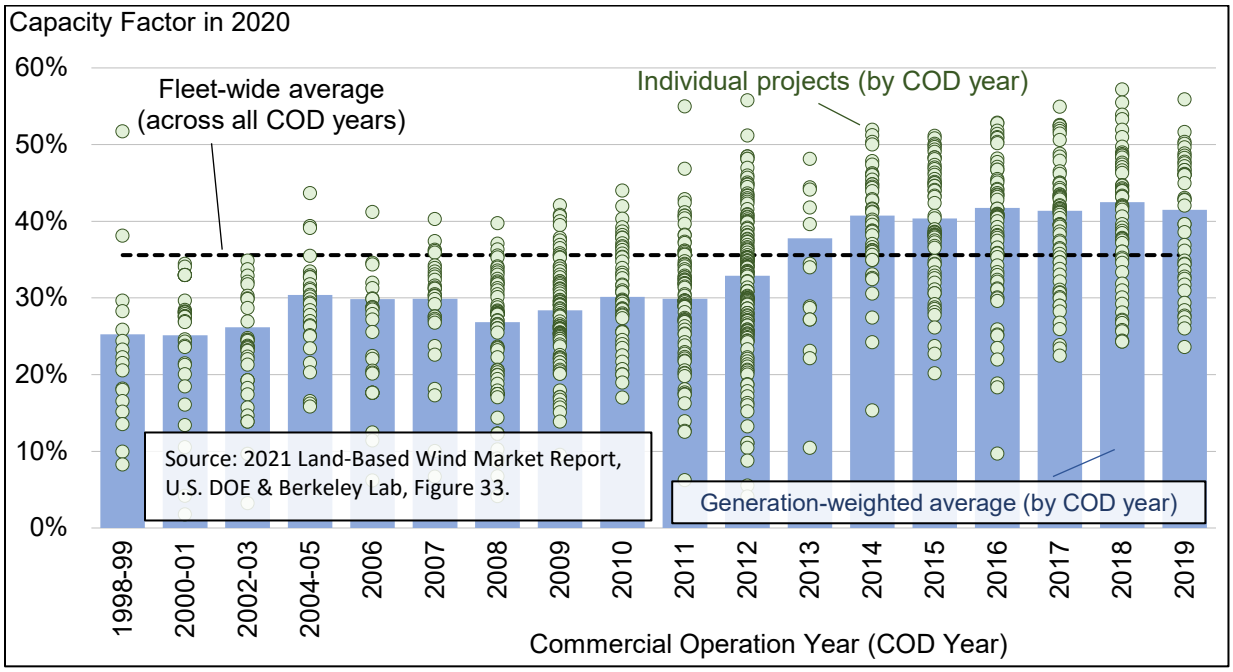


Note: Size of bubble reflects project capacity.

Sources: Berkeley Lab, EIA (some data points suppressed to protect confidentiality)

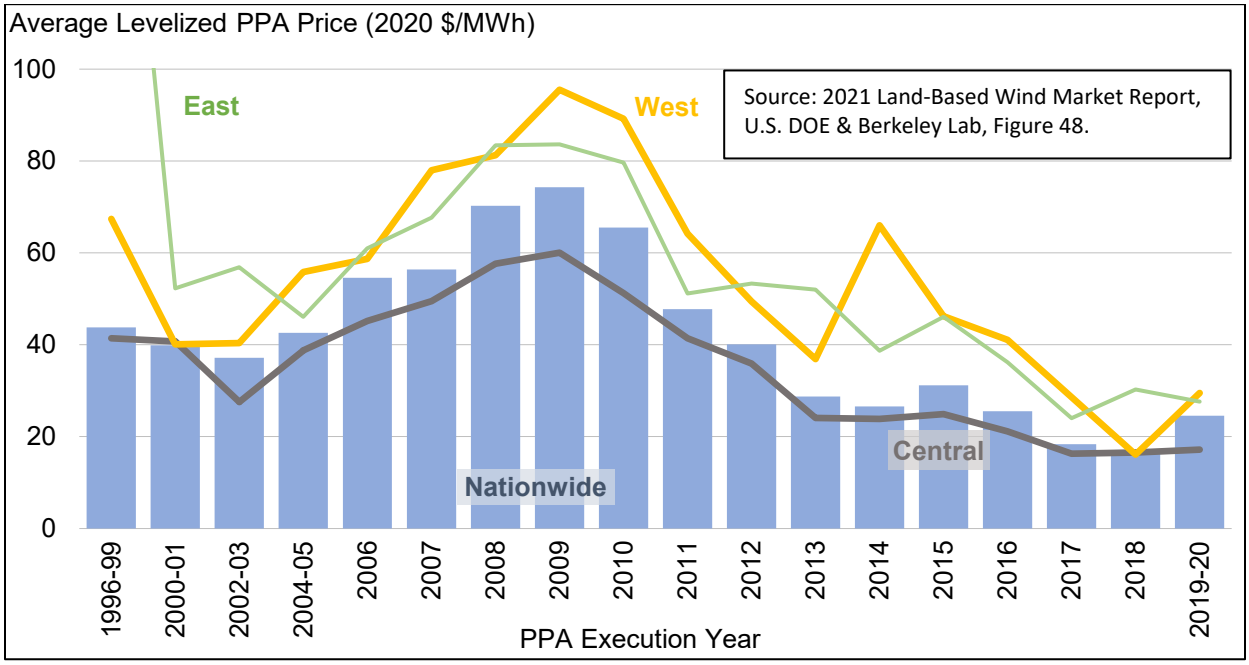
At the same time, wind capacity factors have continued to increase due to higher and larger turbines and improvements in blade design. Average annual capacity factors for U.S. wind power now exceed 40 percent, nearly double the 25 percent achieved in 2000, as illustrated in Figure 15.

Figure 15 – Wind Power Capacity Factors by Year Installed



As a result of declining installed costs and increasing capacity factors, along with sustained wind power credits through the Production Tax Credit (PTC) and various state-level incentives, the price of wind power PPAs has declined over time. As shown in Figure 16, the average levelized PPA cost in the central U.S. has fallen to around $20/MWh (including credits and incentives).

Figure 16 – Generation-Weighted Average Levelized Wind PPA Price by Year of Operation

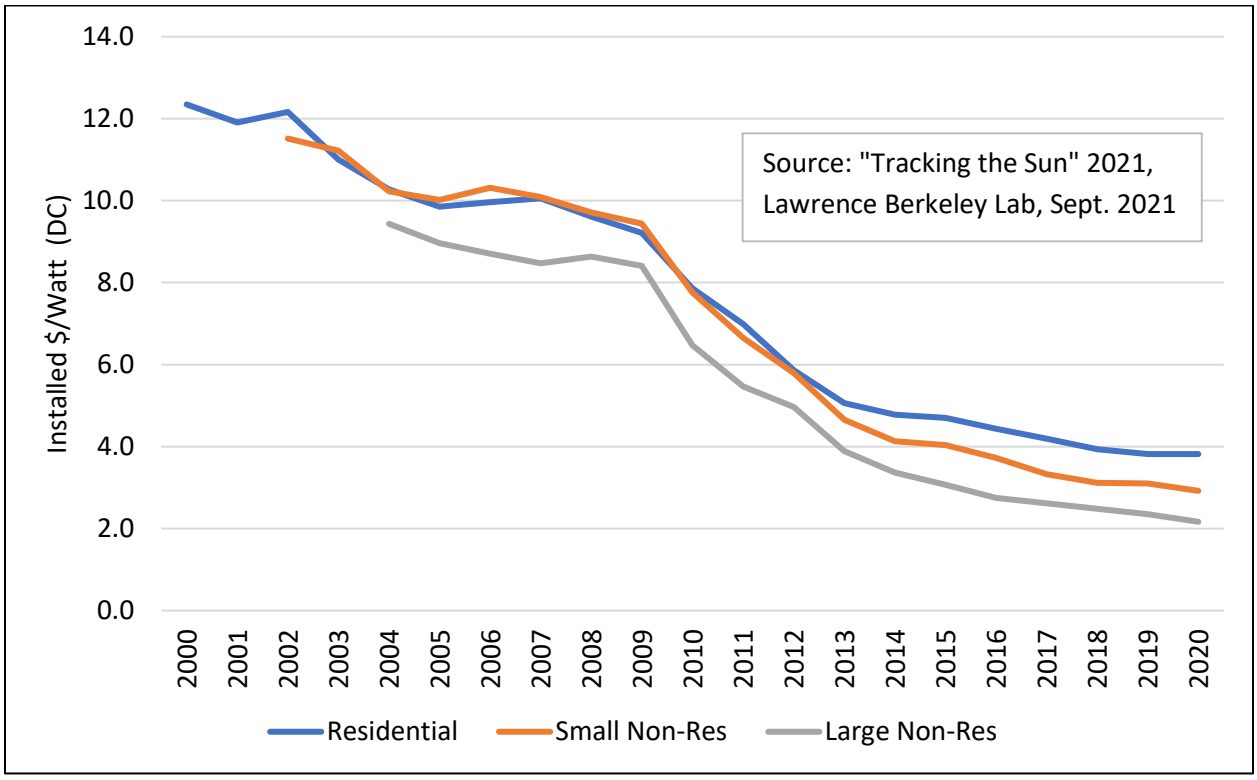


Development of wind power provides jobs in Iowa and provides economic benefits to rural landowners, many of which are customers of CIPCO member systems.

As noted previously, CIPCO has contracted to acquire all of the power from the Independence wind farm that began commercial operation in December 2021. CIPCO continues to evaluate additional opportunities to acquire competitively priced wind power resources.

The price of solar power has also decreased dramatically over the past decade and is currently approaching $2.00 per $Watt_{DC}$ installed for utility-scale installations and just under $4.00 per $Watt_{DC}$ for residential on-site units, as illustrated in Figure 17. Improving efficiencies of panels and inverters, combined with more streamlined installation processes, have contributed to recent price declines. The impacts of tariffs on solar panels, the balance between component supply and demand, and increasing labor costs may cause solar prices to remain flat or increase slightly in coming years. A larger impact on the solar market may be the expiration of solar investment tax credits (ITC) by 2024, although an extension of the ITC is included in the "Build Back Better" bill that was passed by the U.S. House in November 2021 and is pending action in the U.S. Senate as of this report's development.

Figure 17 – U.S. Customer-Owned Solar Installed Cost Trends



CIPCO continues to evaluate opportunities to acquire additional solar resources. It currently has plans to add the following over the IRP planning horizon:

- Purchase all power from the 100-MW_{DC} Coggon Solar project that is under development and is scheduled to come on-line in 2022 or 2023.
- Seek a large solar power addition beginning in 2031 or 2032
- Continue to work with its member cooperatives on smaller solar opportunities that may arise within the CIPCO footprint

Any additional wind and solar power acquisitions in the near term will be opportunistic based on the specific credentials and the costs and benefits of particular projects.

CIPCO continues to monitor the price and availability of energy storage resources to complement CIPCO's intermittent power resources and is prepared to make investments in cost-effective storage opportunities that may arise.

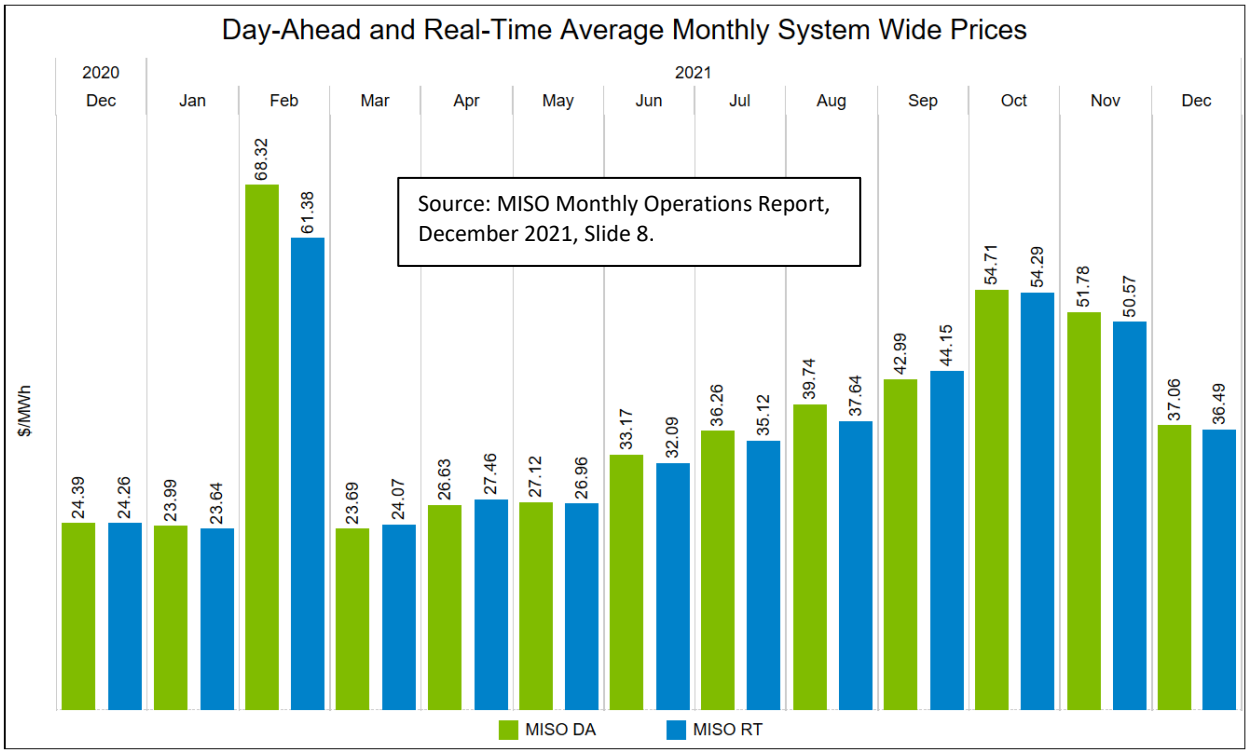
Power Purchase Options

CIPCO currently meets a portion of its total power requirements through a variety of short- and long-term power purchase agreements (PPAs), as discussed previously. These PPAs allow CIPCO to meet its needs while partially mitigating the risks of plant ownership and providing price certainty. For these reasons, CIPCO intends to continue to meet a minority of its future needs through PPAs. However, CIPCO does not intend to over-rely on PPAs as they may leave CIPCO vulnerable to sharp wholesale market price swings and/or the possibility that new PPAs will be unavailable at the time that others expire. In addition, CIPCO manages counterparty PPA risk by considering ownership of new capacity resources.

MISO coordinates a regional wholesale power market and publishes wholesale power prices on an hourly, daily, and monthly basis. MISO wholesale power prices have increased substantially in the last half of 2021 primarily due to sharply higher natural gas prices, as discussed previously. Prior to mid-2021, wholesale power prices had remained historically low over the previous several years.

As illustrated in Figure 18, the MISO monthly wholesale power price averaged roughly $25/MWh in the fall of 2020 and through the winter and spring of 2021, with the exception of February during a period of extreme weather. Starting in June 2021, MISO wholesale power prices moved above $30/MWh on average, exceeding $40/MWh in September 2021 and reaching $54/MWh in October 2021 (excluding ancillary services). This is more than double the price from one year earlier.

Figure 18 – MISO Wholesale Power Price Trends



While some moderation from the October 2021 price peak is expected due to declining natural gas prices, power prices are likely to remain higher than one year ago. Thus, some persistently higher MISO wholesale power prices can be expected for the foreseeable future and it is uncertain if they will return to the levels seen in late 2020 or the first half of 2021.

CIPCO is a member-owner of ACES, headquartered in Carmel, Indiana. CIPCO joined ACES in 2007 to strengthen its risk management process and take advantage of the many services beneficial to CIPCO. ACES offers a wide variety of services including power trading and market monitoring, portfolio modeling, portfolio management, renewable energy credit trading, risk management and training, counterparty credit evaluation, and regulatory policy guidance. ACES services have helped CIPCO better manage power procurement, risk management, and long-term power planning.

ACES helps CIPCO assess future energy and capacity prices for incorporation into its financial forecasts and strategic plans. Based on a current assessment of the regional power market, the price for additional capacity is anticipated to increase in the coming years as excess capacity is absorbed due to load growth combined with numerous coal plant retirements. MISO's projected reserve margin is expected to decline from 24.1 percent in 2022 to 15.1 percent by 2026[10] based on normal weather assumptions. This drops below its reference reserve margin level of 18.3 percent and indicates the need for additional capacity beyond what has already completed the planning and approval process. However, the actual MISO reserve margin is likely to increase from this outlook as more proposed new generation resources complete the approval process and enter service.

Although medium-to-long-term capacity costs are expected to increase as excess capacity slowly shrinks, the projected price of market capacity purchases remains below the cost of a new gas-fired combustion turbine into the foreseeable future. This indicates little incentive to build large-scale merchant peaking capacity except where it is needed for local reliability reasons.

CIPCO also uses data provided by ACES as the basis for its market energy price forecasts. The forecast developed for CIPCO planning purposes uses ACES daily forward energy price curves developed in the summer of 2021. This process develops forward price curves for on-peak periods and for around-the-clock (24/7) periods on a monthly basis throughout the IRP forecast horizon.

ACES predicts that the cost of on-peak wholesale energy will remain relatively stable over the next two years due to moderating natural gas prices and with capacity margins remaining above MISO's reserve margin target. The wholesale price of electricity is expected to increase only slightly after 2023 due to modest natural gas price increases and continued additions of renewable energy resources with zero fuel costs.

These forward price curves are used to guide the trajectory of CIPCO's long-term avoided energy costs for integrated resource planning purposes, which are discussed in more detail in Chapter 6.

[10] NERC 2021 Long-Term Reliability Assessment, December 2021

Transmission Options

Transmission resources alone cannot supply capacity or energy, but they have the potential to relieve congestion, allow access to more competitively priced supply resources beyond CIPCO's immediate footprint, and reduce locational marginal prices (LMP) for purchased power.

As a market participant in the MISO system, CIPCO can take advantage of competitively priced power from across the MISO footprint. Expansion of the regional transmission grid may provide CIPCO access to lower-cost resources in the future, although grid expansion decisions are beyond the sole control of CIPCO. CIPCO participates in MISO planning activities and will continue to monitor future developments to assess potential impacts on supply resource availability and the potential price impacts of future transmission investments.

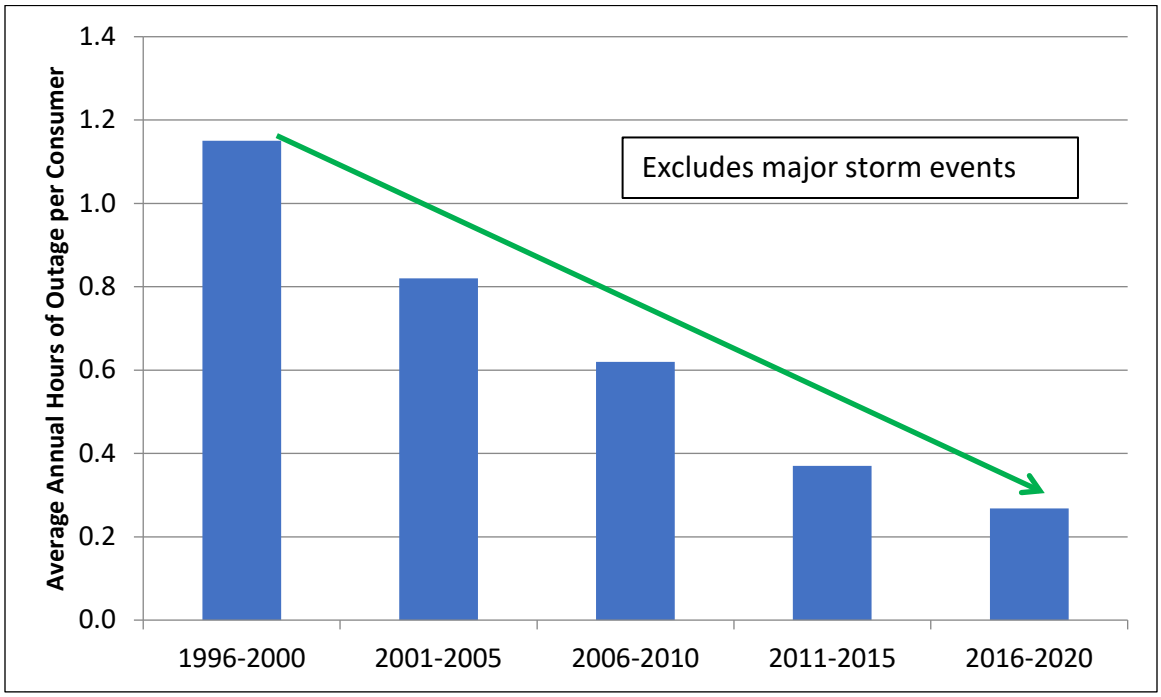
CIPCO's transmission system activities are intended to keep pace with industry standards and to meet or exceed the Rural Utilities Services (RUS) Prudent Utility Practice(s) standard. CIPCO adheres to a generally accepted "cooperative standard", and its planning and work programs are much like that of other cooperatives across Iowa. Transmission system upgrades and maintenance are ongoing efforts with goals that remain much the same from one planning period to the next.

The availability of reliable transmission access will enhance CIPCO's power supply resource options. CIPCO will continue to pursue the following important transmission-related activities as part of its integrated resource plan and ongoing operations processes.

- Support and monitor transmission access and usage rulings, such as FERC Orders 888 and 889 issued in 1996 and 1999, respectively. CIPCO supports and monitors the developments associated with open access rulings and actively participates in providing and purchasing transmission services.
- Monitor trends impacting the regional power industry and maintain a strong presence in the Midwest Reliability Organization (MRO) and MISO. CIPCO representatives participate in committees involving the following activities: management, regional transmission, regional reliability, power and energy marketing, computer model building, accreditation, transmission schedules and compensation, and sub-regional planning activities.
- Continue to meet the RUS guideline of one hour of outage per consumer per year or less. CIPCO's commitment to reliability and service quality is reflected in its 0.27 average hours of transmission outage per consumer per year excluding major storms[11] over the 2016 to 2020 period, as shown in Figure 19. This declining outage rate illustrated in Figure 19 supports CIPCO's commitment to ongoing system replacements, upgrades, expansion, and maintenance programs.

[11] Major storm outages may cause widespread and long-duration outages not related to system deficiencies, planned maintenance outages, or equipment failures and are tracked separately from the data reported here. Most notably, the "derecho" storm on August 10, 2020, caused widespread and long-duration outages across east-central Iowa and severely damaged transmission, distribution, and generation infrastructure.

Figure 19 – CIPCO Average Annual Outage Hours



- Continue to improve the operational efficiency of its transmission system and partner with its distribution member systems to improve system efficiencies through low-loss transformers and other equipment upgrades.
- Coordinate with its member systems on construction work plans and infrastructure improvements. It is anticipated that all 12 member rural electric cooperatives will complete construction work plans within the next five years.
- Continue to participate in joint transmission operations and maintenance activities with neighboring entities, primarily ITC and MidAmerican Energy Company. Joint transmission operations and maintenance activities include, but are not limited to:
    - Regular and special substation maintenance, e.g., protective relaying, Doble testing and infrared thermal scans
    - Pole ground-line treatment
    - Major line maintenance including hardware tightening, cross-arm replacements, and retying conductors
    - Special line maintenance such as replacing arresters, installing ground rods, and adding mid-span spacers
    - Switch maintenance and inspection
    - Right-of-way clearing
    - Resistivity measurements of grounding connections

- New-to-Replace-Old program (systematic efforts to rebuild older portions of the transmission system at voltage levels of 34.5, 69, and 161 kV)
- Breaker New-to-Replace-Old program with a focus on eliminating aging oil-filled breakers

Chapter 6: Preferred Resource Plan

CIPCO's long-term strategic goal is to supply at least 80 percent of its capacity requirements using owned resources plus long-term PPA commitments and to acquire no more than five percent of its power needs from outside of MISO Load Resource Zone 3. This guideline, combined with the resource needs identified in Chapter 3, determine the amount of resources that CIPCO needs to acquire over the IRP planning horizon.

CIPCO's preferred resource plan is selected from the demand-side and supply-side options discussed in the previous chapters. The resource options are evaluated on a consistent basis using benefits and costs, risk management, and other criteria that meet the objectives of this IRP and achieve CIPCO's strategic goals. The resource evaluation and selection process, the assessment of environmental impacts, the resulting preferred resource plan and contingency alternatives are discussed in this chapter.

Integrated Resource Evaluation

Integrated resource evaluation involves comparing demand-side and supply-side resource options to meet CIPCO's future power needs in a reliable and cost-effective manner, consistent with the objectives of integrated resource planning. The process involves these primary steps:

- Forecast CIPCO's avoided energy and capacity costs
- Determine the amount of cost-effective DSM achievable given the avoided costs and other factors
- Select the preferred portfolio of new supply-side resources to meet the remaining power needs

In this manner, resources are treated in a consistent manner and the preferred resources are selected from the various demand-side and supply-side options discussed in the previous chapter.

Avoided Costs

CIPCO's avoided costs of capacity and energy are the costs associated with acquiring incremental supply resources. Demand-side programs that can be implemented for less than CIPCO's avoided cost of power (including system losses and externalities) are cost-effective and are added to CIPCO's resource mix. CIPCO's future avoided cost estimates are developed using the ACES forward price curves for MISO Load Resource Zone 3 capacity and for MISO energy, as discussed in Chapter 5, and are considered proprietary and confidential. CIPCO's avoided costs for the purposes of DSM evaluations also include transmission and distribution energy and demand losses and externalities costs.

Wholesale market power costs increased in 2021 due to the higher cost of natural gas but are expected to moderate somewhat in 2022 and 2023 due to strengthening gas supply and slow demand growth. Avoided capacity costs increase modestly over time due to anticipated unit retirements contributing to the erosion of excess power supply in the MISO region. Sharper capacity cost increases are expected later in this decade given increasing supply constraints.

These avoided costs are used as the basis for evaluating the cost-effectiveness of CIPCO's energy-efficiency programs. The impacts of externalities are added, at an estimated 10 percent per IUB rules, to delivered energy cost in program evaluations to recognize additional societal costs not embedded in the avoided cost of generation. In this manner, demand-side resource options are evaluated on a basis that is consistent with supply-side resource options with regard to meeting the future power needs of the CIPCO system.

Selected Demand-Side Resources

As discussed previously, CIPCO has a broad spectrum of energy efficiency and interruptible power programs that are cost-effective from a total resource cost perspective and provide benefits to the member-owners of CIPCO's member systems. The DSM programs were evaluated against CIPCO's avoided costs and selected based on their cost-effectiveness, forming a consistent and integrated basis of evaluation with power supply alternatives using CIPCO's avoided costs.

Projections of DSM program impacts were presented in Chapter 4. These included detailed participation and energy projections for each of CIPCO's DSM programs over a five-year horizon and aggregate DSM impacts through the remainder of the IRP horizon. These DSM program impacts are already incorporated into the load forecasts that drive CIPCO's resource needs, as discussed in Chapter 3.

An additional advantage of DSM programs is that they can be planned, approved, developed, and begin operation within a few years compared to longer time frames for central-station generation. This provides additional planning flexibility while meeting a significant portion of CIPCO's resource needs.

Selected Supply-Side Resources

CIPCO's DSM programs capture energy efficiencies and help reduce total energy consumption and summer peak demands among end-use consumers on the CIPCO system. Beyond cost-effective DSM, additional resource needs on the CIPCO system will be met with a variety of supply-side resources.

CIPCO continually monitors the regional market and engages other parties in discussions about potential new power supply resources. It also evaluates an array of power supply resources based on lifecycle costs and benefits, risks, environmental impacts, and other criteria. In recent years, the combination of modest load growth and relatively low market power prices has allowed CIPCO to avoid acquiring new central-station generation while enhancing its portfolio of wind and solar power, along with flexible peaking resources to complement its intermittent supply resources. These factors are expected to persist into the foreseeable future and will drive CIPCO's resource strategy over the next several years.

Based on CIPCO's analysis, the following power supply alternatives have been identified as preferred resource options over the next 15 years:

Increase Wind and Solar Power Purchases

CIPCO continues to increase the amount of wind and solar power supplied to its system through long-term power purchase agreements (PPAs). The attributes and cost trends for utility-scale wind and solar resources were discussed in Chapter 5. The amount of wind and solar power is being increased for a variety of reasons, including:

- The declining cost of wind and solar resources in recent years, particularly utility-scale solar
- The proximity of resources to the CIPCO system and local economic benefits
- Increased fuel diversity and decreased fuel price risk across the CIPCO system
- Reduced environmental liabilities risk compared to other forms of generation
- Financial incentives such as tax and production credits that lower PPA costs
- Solar generation during daytime hours when loads and power prices are typically higher
- Public acceptance of, and demand for, renewable energy

For these reasons, CIPCO believes that a strong emphasis on wind and solar power as part of its integrated resource plan provides cost-effective power supply, represents prudent risk management, and is a sound business decision.

CIPCO currently has plans to add the following wind and solar resources in the next several years. Acquisition of these resources is in various stages of planning, negotiation, or construction.

- The 54 MW Independence wind facility began operation in December 2021.
- The 100 MW_{AC} Coggon solar facility is expected to begin operation in 2023 (delayed from 2022).
- CIPCO's long-term plan includes approximately 100 MW of new solar resources after 2030.

Landfill gas and other biomass resources will be considered based on availability and cost, although no opportunities to purchase new biomass power are known at this time.

Add Peaking Capacity with Load Following Capability

The continued expansion of intermittent resources on the CIPCO system and in Iowa has increased the need for rapidly-dispatchable resources to provide power in real time when wind or solar generation temporarily declines. This "load-following" capability has proven to have increasing value as the amount of wind and solar resources expands in the region. For this reason and to fulfill CIPCO's capacity requirements, CIPCO plans to continue adding smaller, natural gas-fired generation similar to the three reciprocating engines installed at Summit Lake in 2021. The advantages of this approach include:

- Smaller incremental capital cost commitments compared to larger combustion turbines
- Relatively low emissions compared to diesel reciprocating engines
- The ability to "load follow" (increase or decrease generation quickly) in response to changing conditions on the power grid, such as changing intermittent generation
- Relatively short lead times for permitting and placement, providing CIPCO with substantial planning flexibility and risk management advantages
- The ability to site units in distributed locations across the system, providing system support, improving reliability, and potentially deferring future transmission and distribution investments

CIPCO's current financial plan includes the addition of 75 MW of gas-fired reciprocating generation in the 2029 to 2032 period in increments of 25 MW, based on current identified regulatory capacity needs. These blocks of generation will likely be geographically dispersed across the CIPCO system, but specific locations will be based on further financial and engineering analysis. This plan is flexible and will be adjusted based on CIPCO's changing generation and system needs along with wholesale power market price signals. CIPCO's annual load forecasting and financial forecasting processes provide comprehensive updates of system needs and will determine the magnitude and timing of specific generation additions.

Continue Limited Short-Term PPAs

As noted previously, CIPCO's goal of obtaining the majority of its power supply from owned resources and long-term PPAs is an effective and prudent risk management strategy. CIPCO's guideline is to continue to purchase up to 20 percent of its required capacity resources to meet its needs and to manage its risks of plant ownership. The use of PPAs provides flexibility for CIPCO to plan its power supply resources relative to changing wholesale market price, fuel price, load growth, emissions limitations, or other risks that it may encounter. Changes in the wholesale price of power and arising opportunities to purchase cost-effective capacity and/or energy may alter CIPCO's plan to some extent.

Monitor Energy Storage Costs and Availability

Energy storage technologies continue to improve and prices are declining. CIPCO is monitoring the prices and potential applications of energy storage to meet a portion of its supply needs or to defer system investments. CIPCO may invest in energy storage if the attributes provide an optimal resource strategy, although no specific energy storage investments are planned at this time.

Power Supply Summary

The addition of new wind and solar resources plus small, gas-fired generation and limited quantities of market power purchases will alter CIPCO's resource mix over time. The resulting resource plan provides a balanced and diversified strategy to meet the future power supply needs of its member systems in a cost-effective manner while mitigating exposure to fuel price volatility and environmental risks.

CIPCO will derive an increasing share of its energy and capacity resources from wind, solar, and natural gas generation resources over the IRP planning horizon. As a result, the percentage share of power from coal and diesel resources will generally decline, although the capacity factors of coal plants will be impacted by wholesale market power prices that are beyond CIPCO's control. The addition of the natural gas generation resources complements the increase in intermittent power on the CIPCO system by providing firm capacity and load-following capabilities.

As is evident in Figure 20 and Figure 21, and in Table 7 and Table 8, wind and solar are contributing an increasing share of CIPCO's power supply and will continue to increase over the IRP horizon. However, they only comprise a modest portion of CIPCO's summer capacity obligations. Conversely, the addition of new natural gas generation and bilateral regulatory capacity purchases meet an increasing share of CIPCO's summer capacity obligations but a more modest portion of CIPCO's annual energy needs. CIPCO's energy and summer capacity supply-side resources over the 2020 to 2036 period are consistent with its most recent financial forecast as summarized in the graphs and tables on the following pages.

Table 7 – CIPCO Energy Supply Portfolio (GWh)

Year	Nuclear	Coal	Natural Gas	Wind	Solar	Other	Market	Energy Req'mnts
2020	581	615	13	946	11	138	678	2,983
2021	0	995	73	936	216	153	731	3,103
2022	0	1,061	66	1,136	228	115	581	3,187
2023	0	1,055	69	1,216	446	97	390	3,271
2024	0	1,102	82	1,275	443	97	356	3,355
2025	0	1,058	69	1,271	441	99	452	3,390
2026	0	1,069	70	1,271	439	102	474	3,425
2027	0	1,041	68	1,271	437	106	542	3,466
2028	0	965	64	1,275	434	116	652	3,508
2029	0	979	87	1,271	432	97	678	3,545
2030	0	971	110	1,271	430	97	699	3,578
2031	0	921	120	1,271	647	97	558	3,614
2032	0	887	94	1,275	644	97	656	3,652
2033	0	840	91	1,271	640	91	753	3,686
2034	0	857	88	1,271	637	86	779	3,719
2035	0	861	101	1,271	634	86	801	3,753
2036	0	857	87	1,275	631	86	858	3,793

Figure 20 – CIPCO Energy Supply Portfolio

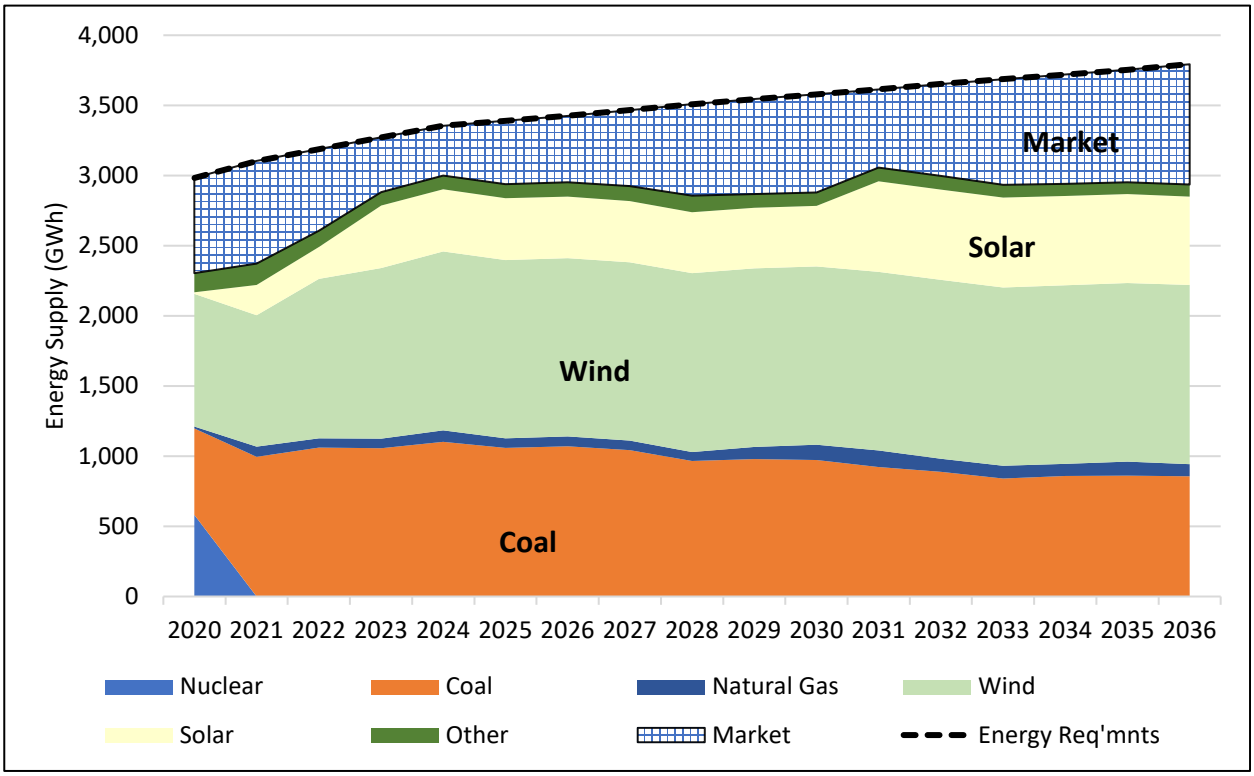
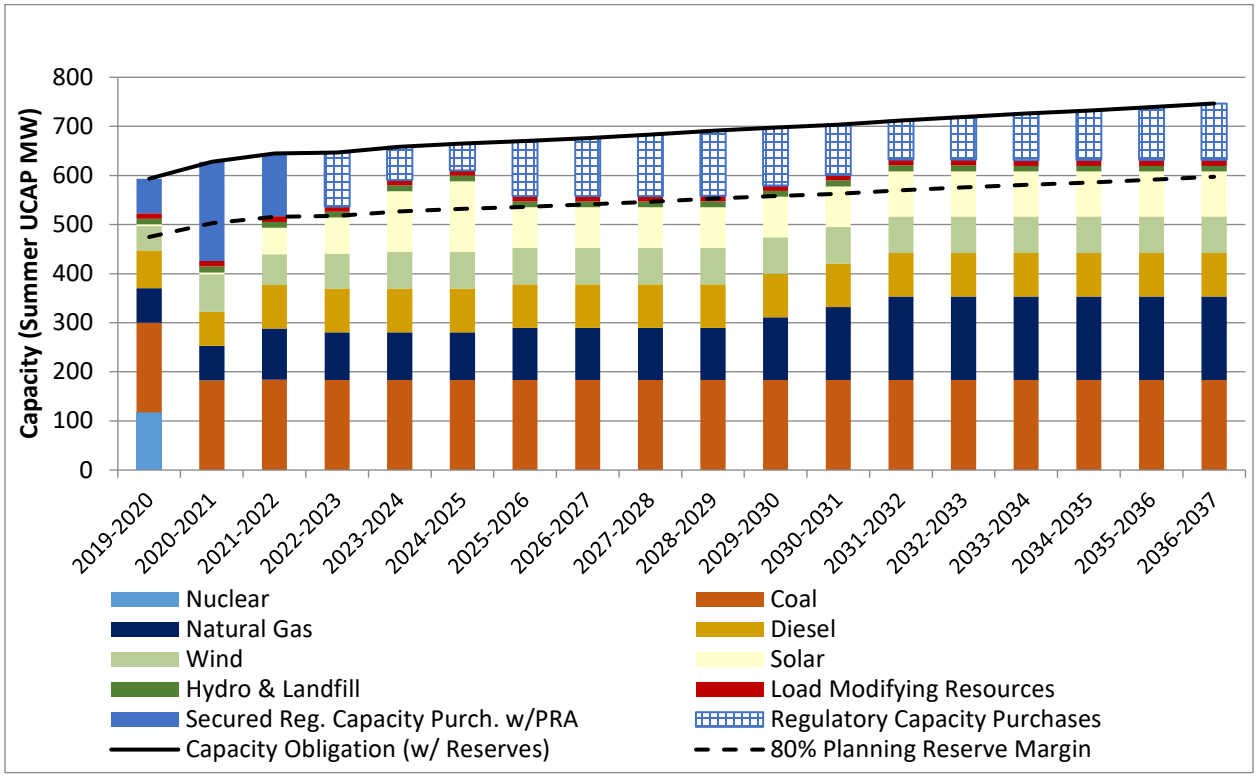


Table 8 – CIPCO Summer Capacity Portfolio (Summer UCAP MW)

Planning Year	Nuclear	Coal	Nat. Gas	Wind	Solar	Diesel	WAPA	LMR	LFG	Reg. Cap. Purchase	Total
2019-2020	117.5	182.8	69.8	49.6	4.0	77.0	10.2	10.9	1.0	70.6	593.4
2020-2021	-	182.8	70.1	76.0	4.0	69.6	10.9	11.6	1.1	201.9	628.0
2021-2022	-	184.3	103.9	62.7	54.0	88.7	10.9	11.7	1.1	127.6	644.9
2022-2023	-	183.3	97.4	71.0	74.0	88.8	10.9	10.4	1.1	110.0	646.9
2023-2024	-	183.3	97.4	74.3	124.0	88.8	10.9	10.6	1.1	68.4	658.8
2024-2025	-	183.3	97.4	74.3	144.0	88.8	10.9	10.7	1.1	54.3	664.8
2025-2026	-	183.3	106.3	74.3	82.6	88.8	10.9	10.8	1.1	112.0	670.1
2026-2027	-	183.3	106.3	74.3	82.6	88.8	10.9	11.0	1.1	117.8	676.1
2027-2028	-	183.3	106.3	74.3	82.6	88.8	10.9	11.1	1.1	125.0	683.4
2028-2029	-	183.3	106.3	74.3	82.6	88.8	10.9	11.3	1.1	132.4	691.0
2029-2030	-	183.3	127.5	74.3	82.6	88.8	10.9	11.4	1.1	117.9	697.8
2030-2031	-	183.3	148.8	74.3	82.6	88.8	10.9	11.6	1.1	102.3	703.7
2031-2032	-	183.3	170.0	74.3	92.0	88.8	10.9	11.8	1.1	79.8	712.0
2032-2033	-	183.3	170.0	74.3	92.0	88.8	10.9	11.9	1.1	87.1	719.4
2033-2034	-	183.3	170.0	74.3	92.0	88.8	10.9	12.1	-	94.6	726.0
2034-2035	-	183.3	170.0	74.3	92.0	88.8	10.9	12.2	-	100.8	732.3
2035-2036	-	183.3	170.0	74.3	92.0	88.8	10.9	12.4	-	107.4	739.1
2036-2037	-	183.3	170.0	74.3	92.0	88.8	10.9	12.5	-	114.8	746.6

The modest changes to summer capacity for natural gas generation in 2025-2026 and changes to solar capacity in 2025-2026 reflect expected changes in accreditation based on capacity availability and MISO criteria, not physical changes in the underlying physical resources.

Figure 21 – CIPCO Summer Capacity Supply Portfolio



CIPCO's strategy to add smaller, fast-ramping natural gas generation aligns well with the changing energy landscape and MISO's needs for the future. For CIPCO, the new units will provide responsive, flexible generation that pairs well with current and future intermittent resources. Dispersed additions across the CIPCO service territory may improve the reliability and security of the entire system. This strategy enables CIPCO to place generation in areas of need and to avoid other, more expensive, methods of improving reliability. Future investments in energy storage technologies may contribute to these strategic attributes. Utilizing smaller, less-centralized generation units also spreads the capital costs of building new resources over a greater number of years and allows CIPCO to manage its wholesale rate, remain competitive, and provide cost-effective power and services to its members.

Resource Adequacy

CIPCO files an updated load forecast and resource capability with MISO in accordance with its Resource Adequacy guidelines, at least annually. The load forecast report details CIPCO's load forecast on both a firm and non-firm basis and includes the impacts of DSM programs. Resource capability is included for CIPCO's available generators and resources that have been secured through contracts.

The resource adequacy report in Table 9 reflects the balance of expected power needs, including the MISO-required reserve margin and resources following MISO's Resource Adequacy calculations[12]. The amount of projected excess or shortfall over a long-term planning horizon is reflected and is consistent with the preferred resource plan identified in this IRP. The load and capability analyses incorporate expected load growth including the impacts of DSM programs and planned new power resources including PPAs.

The resource adequacy evaluation indicates that CIPCO is expected to have some summer capacity shortfall for the duration of the forecast (on a normal weather basis) given its owned resources and long-term PPAs. The deficit lies within CIPCO's strategy of meeting less than 20 percent of capacity requirements through regulatory capacity purchases throughout the forecast horizon. Anticipated regulatory capacity purchases are added to keep supply and demand in relative balance over the 2022 to 2036 IRP planning horizon, as shown in Table 9.

Future supply additions incorporate the key elements of the preferred resource plan, including continued implementation of CIPCO's extensive array of DSM programs, at least one large new solar resource and the addition of small gas-fired generation units over the IRP horizon. As previously mentioned, the natural gas-fueled plants help fill CIPCO's need for firm capacity to complement CIPCO's acquisition of intermittent resources, while providing system reliability support and planning flexibility. This represents a continuation of the strategy implemented as part of CIPCO's 2017 IRP that resulted in the addition of three reciprocating gas-fired generators at Summit Lake that came on-line in 2021.

[12] The financial forecast and resource adequacy table upon which these analyses are based assumed that the Coggon solar facility would be operational by the end of 2022. Recent delays may shift this into 2023. Any shortfalls during the delay period may require supplemental short-term wholesale market purchases.

CIPCO Resource Adequacy

Planning Year [1]	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027	2027-2028	2028-2029	2029-2030	2030-2031	2031-2032	2032-2033	2033-2034	2034-2035	2035-2036	2036-2037
Requirement (MW Values)																	
CIPCO Total Demand w/o losses	603.6	620.3	624.0	635.4	641.8	648.0	655.0	662.7	670.8	678.0	684.4	691.2	698.3	704.8	710.9	717.5	724.8
Diversity with MISO, MW	50.1	51.3	51.6	52.6	53.1	53.6	54.2	54.8	55.5	56.1	56.6	57.2	57.8	58.3	58.8	59.4	60.0
Coincident Demand w/o losses	553.5	569	572.4	582.8	588.7	594.4	600.8	607.9	615.3	621.9	627.8	634	640.5	646.5	652.1	658.1	664.8
MISO Estimated Transmission Losses, MW	23.2	20.5	19.5	19.9	20.1	20.4	20.6	20.8	21.0	21.2	21.4	21.6	21.9	22.0	22.2	22.5	22.7
Coincident Demand w/MISO Losses	576.7	589.5	591.9	602.7	608.8	614.8	621.4	628.7	636.3	643.1	649.2	655.6	662.4	668.5	674.3	680.6	687.5
MISO Module E-1 Reserves	51.3	55.4	55.0	56.1	56.0	55.3	54.7	54.7	54.7	54.7	54.5	56.4	57.0	57.5	58.0	58.5	59.1
Planning Reserve Margin Requirement	**628.0**	**644.9**	**646.9**	**658.8**	**664.8**	**670.1**	**676.1**	**683.4**	**691.0**	**697.8**	**703.7**	**712.0**	**719.4**	**726.0**	**732.3**	**739.1**	**746.6**
Capability (UCAP values)																	
Total Coal ZRCs	182.8	184.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3	183.3
Total Natural Gas ZRCs	70.1	103.9	97.4	97.4	97.4	106.3	106.3	106.3	106.3	127.5	148.8	170.0	170.0	170.0	170.0	170.0	170.0
Total Diesel ZRCs	69.6	88.7	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8	88.8
Wind ZRCs	76.0	62.7	71.0	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3	74.3
Landfill ZRCs	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.0	0.0	0.0	0.0
Solar ZRCs	4.0	54.0	74.0	124.0	144.0	82.6	82.6	82.6	82.6	82.6	82.6	92.0	92.0	92.0	92.0	92.0	92.0
Total Wind/Solar/Landfill ZRCs	81.1	117.8	146.1	199.4	219.4	158.0	158.0	158.0	158.0	158.0	158.0	167.4	167.4	166.3	166.3	166.3	166.3
REGULATORY CAPACITY TRANSACTIONS																	
Secured ZRC Purch/(Sale)	201.9	127.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ZRC Purch / (Sale)	0.0	0.0	110.0	68.4	54.3	112.0	117.8	125.0	132.4	117.9	102.3	79.8	87.1	94.6	100.8	107.4	114.8
Regulatory Capacity Purchase ZRCs	201.9	127.6	110.0	68.4	54.3	112.0	117.8	125.0	132.4	117.9	102.3	79.8	87.1	94.6	100.8	107.4	114.8
EXTERNAL RESOURCES																	
External Resource: WAPA	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
DEMAND RESOURCES																	
Load Modifying Resources	11.6	11.7	10.4	10.6	10.7	10.8	11.0	11.1	11.3	11.4	11.6	11.8	11.9	12.1	12.2	12.4	12.5
Net ZRCs [3]	**628.0**	**644.9**	**646.9**	**658.8**	**664.8**	**670.1**	**676.1**	**683.4**	**691.0**	**697.8**	**703.7**	**712.0**	**719.4**	**726.0**	**732.3**	**739.1**	**746.6**
Surplus/(Deficit)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

NOTES:

[1] The MISO planning year runs from June through May.

[3] ZRC is the zonal resource credit for MISO Module E-1. One MW is equivalent to one ZRC.

Table 9 - CIPCO Resource Adequacy

Environmental Assessment

CIPCO's preferred resource plan contains a balanced mix of demand-side resources, substantial wind and solar resources, and gas-fired generation that minimizes environmental impacts and risks compared to other alternatives.

Compliance with current and future environmental requirements represents a highly important focal point for the CIPCO organization and is an integral aspect of resource planning. Managing the risk exposure represented by environmental factors is accomplished through a combination of proactive strategies. These initiatives include investments in carbon/emission-free generation, improvements in plant efficiencies, use of lower emission-producing fuels (e.g., natural gas and lower-sulfur coal), installation of advanced abatement equipment, and the prudent use of allowance markets.

Table 10 summarizes the capital-intensive environmental compliance actions that CIPCO and its partner plant owners have already taken and additional efforts expected in the coming years. Abatement actions are listed in the first column and the mitigation target(s) are shown in the second column. The remaining columns indicate the coal plants where the actions were taken and which environmental regulations were the primary driver(s). CIPCO's affected units consist of Walter Scott Energy Center Units 3 and 4 (WSEC3 & WSEC4), and Louisa Generating Station (LGS). As noted in the table, these units are impacted by both air regulations and rules regarding land and water.

Table 10 – Environmental Abatement Actions

		CIPCO Coal-fired Unit			Air Regulations			Land & Water Regulations		
Abatement Equipment & Facilities	**Mitigated Impact**	**WSEC3**	**WSEC4**	**LGS**	**CSAPR**	**MATS**	**NAAQS**	**CCR**	**ELG**	**316b**
Scrubber (Spray Dryer)	Acid Gas	X	X	X	X	X	SO_2			
Electrostatic Precipitator (ESP)	Particulate Matter	X	*N/A* [1]	X		X	Lead, PM			
Baghouse	Particulate Matter	X	X	X		X	Lead, PM			
Selective Catalytic Converter (SCR)	Nitrogen Oxides		X		X		NO_x, O_3			
Low NOx Combustion (LNB & OFA)	Nitrogen Oxides	X	X	X	X		NO_x, O_3			
Activated Carbon Injection	Mercury	X	X	X		X				
Dry Bottom Ash Boiler	Combustion Residue	X	X	X				X	X	
Retired and/or Abated Wet Ash Impoundments	Combustion Residue	X	*N/A* [2]	X				X	X	
Modern Dry Ash Monofills w/ Liner	Combustion Residue	X		X				X	X	
Wastewater Treatment Facilities	Wastewater/Runoff	X		X					X	
River Cooling Intake Modifications	Fish Entrainment	Planned	*N/A* [3]	*N/A* [3]						X

1- All units are able to fully comply with operating permits using only their respective baghouses. WSEC3 and LGS have retrofitted baghouses in addition to their original ESPs, which are still being operated to reduce baghouse O&M and combustion residue loading to the dry ash monofills. WSEC4 was engineered to require only a baghouse for PM control.

2 - WSEC4 was designed & built with a dry bottom ash system and therefore does not contribute to the wet ash impoundment at the WSEC facility.

3 - WSEC4 and LGS do not use once-through river cooling systems and instead use cooling towers.

There are many more regulations impacting the operations of CIPCO's affected units than are listed here. The regulations shown in the table represent some of the more impactful and recently updated or promulgated compliance requirements. The Cross-State Air Pollution Rule (CSAPR), Mercury and Air Toxics Standards (MATS) and National Ambient Air Quality Standards (NAAQS) comprise the Air Regulations. The Coal Combustion Residual Rule (CCR) regulates coal ash, Effluent Guidelines (ELG) control wastewater discharges, and 316b refers to that section of the Clean Water Act which is intended to reduce the number of fish and shellfish drawn in by coal plant cooling water intakes. These comprise the Land & Water Regulations.

There are no direct rules or regulations limiting CO_2 or other greenhouse gasses, although the potential for new regulations exists within the remaining expected lifetime of these units. The impacts of any proposed regulations will be evaluated by CIPCO and the primary plant owner at the appropriate time.

CIPCO's broad spectrum of energy efficiency programs for residential, agricultural, and business consumer-members mitigates the need for energy supply and peak demand capacity from generation resources, eliminating a portion of the environmental impacts associated with fuel combustion and constructing power infrastructure. Furthermore, CIPCO's promotion of high-efficiency geothermal heat pumps contributes a form of demand-side renewable energy to its resource mix. CIPCO continually monitors and evaluates emerging avenues for achieving further decreases of emissions, including smart grid explorations and related technologies.

CIPCO's acquisition of wind, solar, and landfill gas generation resources along with its allocation of hydropower from WAPA reduces its dependence on fossil fuels and the environmental impacts and risks associated with coal and natural gas generation. CIPCO's planned investments in solar and natural gas generation will continue to diversify its fuel supply and reduce its environmental impacts on air, soil, and water compared to coal-fired generation.

New and changing environmental regulations may impact CIPCO's resource mix and associated risks. Through the use of internal resources and external expertise, CIPCO will evaluate current and emerging environmental regulations for their potential effect on CIPCO's resource strategy. CIPCO's overall response to new environmental regulations is not only an important strategic issue but also represents an important area of corporate responsibility that CIPCO takes seriously. One of the strategic priorities that guides the organization is a commitment to managing the carbon intensity from the generation portfolio. This key focus informs future resource decisions by applying best practices in sustainable environmental stewardship.

CIPCO's financial forecast indicates that the monetary effect of future environmental regulations on CIPCO's business case is very manageable. CIPCO integrates three major components in its approach:

1. A relatively low emissions portfolio with a flat-to-declining share from carbon-based resources;
2. A strategic approach to planning with regular and comprehensive updates; and
3. Demand-side management and beneficial electrification programs.

CIPCO's balanced energy portfolio and its array of demand-side management and energy-efficiency initiatives strengthen its ability to manage exposure to environmental regulations. Additionally, CIPCO's strategic approach to environmental issues has achieved success through its use of internal and external forecasts as well as market and regulatory intelligence. Continued attention to these priorities will allow CIPCO to best serve its membership base while exercising both a high level of corporate social responsibility and good environmental stewardship.

Plan Meets Key Objectives

CIPCO's preferred resource plan meets several key objectives, including the provision of adequate, safe, and reliable service, maintaining competitive costs to consumers, minimizing environmental impacts and risks, and ultimately fulfilling CIPCO's mission as a consumer-owned utility.

Providing Adequate and Reliable Service

In recent years, CIPCO has made substantial long-term investments in wind and solar power combined with increases in complementary natural gas-fired peaking generation. This resource strategy will be continued into the IRP planning horizon to meet CIPCO's growing power needs while retaining a high level of resource adequacy to meet peak power demands. It also meets CIPCO's objectives of limiting reliance on any single power supply source to 25 percent of capacity requirements (to mitigate geographic risks) and limiting reliance on any single fuel type to 40 percent of installed capacity requirements (to mitigate market and regulatory risk).

In addition to its own resources, CIPCO will continue to make supplemental capacity and energy purchases to meet a modest portion of its resource requirements. The preferred resource plan meets CIPCO's objectives of limiting market power purchases to no more than 20 percent of capacity requirements with no more than five percent of requirements purchased from outside of MISO Zone 3. It will also meet CIPCO's target of market purchases limited to no more than 10 percent of on-peak and 30 percent of off-peak energy requirements during the summer and winter seasons.

CIPCO's participation in MISO and its capacity reserve requirements will ensure that CIPCO maintains adequate supply resources on an ongoing basis. In addition, its participation in regional transmission planning, operations, and maintenance will help ensure reliable delivery of power to the end-use consumers on its system.

Maintaining Competitive Costs

CIPCO's combination of strong and sustained demand-side resource promotion, continued acquisition of low-cost solar resources, and investments in gas-fired peaking and load-following resources reflect sound planning principles along with prudent management of fuel price and environmental risks. In addition, the recent closure of the DAEC nuclear plant removed a relatively high-cost resource from CIPCO's portfolio and contributed to declining wholesale power prices to its membership.

Available demand-side options and supply-side resources are evaluated on a consistent basis using CIPCO's avoided cost projections. This results in the implementation of a robust set of cost-effective DSM programs that are the foundation of CIPCO's resource strategy. Additional resource acquisitions and power purchases reflect opportunities to further diversify CIPCO's resource portfolio while taking advantage of the ability to secure energy and capacity from the MISO marketplace. The combination of load growth, capacity retirements, and increasing wholesale power prices may signal the need to select additional resources to supplement to CIPCO's portfolio over the long term. However, the uncertainty of future wholesale power prices and load growth merit consideration of resources that maximize planning flexibility while minimizing financial risks and commitments.

Minimizing Environmental Impacts and Risks

CIPCO's sizeable acquisitions of wind and solar power along with its investments in small increments of gas-fired peaking generation reflect CIPCO's commitment CIPCO's continued focus on minimizing environmental impacts.

CIPCO's preferred resource plan meets its goal to limit total annual generation carbon intensity to 770 lbs./MWh while greatly reducing its risks and potential compliance costs associated with:

- Greenhouse gas tax or cap & trade mechanisms
- Renewable or clean-energy portfolio standards
- Emissions controls capital and operating costs
- Emissions allowance costs
- Over-reliance on any one resource

Fulfilling CIPCO's Mission

CIPCO's ultimate purpose is to create value for its Member-owners as their preferred business partner in the production, packaging, and delivery of energy services to rural and suburban markets. It accomplishes this purpose through its key values of responsiveness to its members, sound judgment in its business operations and strategies, and collaboration to construct solutions that benefit its membership. The preferred plan is consistent with these core values and helps fulfill CIPCO's key mission of proving Member-owners with wholesale power and services in a safe, reliable and cost-effective manner.

The preferred resource plan is based on sound judgment using a prudent set of methodologies and analyses. The balanced approach to meet future needs represents a reasonable strategy that promotes energy efficiency and conservation, environmental stewardship, and fuel diversity. The plan provides for adequate and reliable service to consumers on the CIPCO system, mitigates potential future risks to its power supply availability and fuel price volatility, and is consistent with the desires of its member-systems. CIPCO's generation portfolio is forecasted to perform well in an ever-changing market.

This plan is a collaborative effort involving input from CIPCO staff, the member managers and Board of Directors representing its member-systems, the general public, and third parties that have contributed information and analyses used in this report. Collaboration among these various parties has helped ensure that the preferred plan is prudent and will be beneficial to CIPCO's member-systems.

Uncertainty and Contingency Management

The CIPCO integrated resource plan analyses include a variety of assumptions and forecasts about future load growth, fuel and capital costs, environmental regulations, delivery of DSM measures, and other factors that are inherently uncertain. These assumptions help shape the actions recommended in the preferred resource plan. However, changes in key assumptions could result in changes to the preferred plan during the 15-year IRP planning horizon. A set of possible changes to key assumptions are discussed in this section along with hypothetical reactions to those changes. This list of assumptions and

subsequent plan changes is not exhaustive but is intended to qualitatively evaluate a set of possible future outcomes that deviate from the base-case.

Load Growth Changes

Chapter 3 discussed CIPCO's most recent load forecast, which incorporated the impacts of CIPCO's DSM programs into the base-case forecast. The high and low economic growth and weather scenarios were also discussed, providing a range of plausible future load levels given different economic growth and weather drivers. Realization of these high or low scenarios will impact CIPCO's resource needs.

The base-case load forecast has an average annual energy growth rate of 1.3 percent over the 2021 to 2040 load forecast horizon. By comparison, the slow economic growth scenario has a 0.5 percent annual growth rate and the rapid economic growth scenario has a 2.1 percent annual growth rate over the forecast horizon. These growth rates incorporate substantial uncertainty regarding long-term economic growth and assumed load levels for a handful of very large energy users within the CIPCO system.

Faster-than-expected load growth would result in additional resource needs over a shorter time period. This would likely result in additional wholesale market purchases in the short term, more aggressive promotion of DSM programs, and a faster and/or larger deployment of gas-fired generation or additional purchases from utility-scale wind or solar energy facilities. If more rapid growth is expected to be sustained over the long term, CIPCO may consider participating in a larger, central station gas-fired power plant or other resources, should those options be available.

Slower-than-expected load growth could result in lower wholesale market purchases in the short term. In the medium-to-long term, slow load growth could merit some delay or deferment of the planned additions of solar power purchases and gas-fired peaking power generation. It is anticipated that slower-than-expected load growth across the region would lead to lower wholesale power market prices and provide CIPCO the opportunity to extend the time frame over which it purchases a larger amount of wholesale power rather than investing in new generation assets or long-term PPAs.

Fuel Price Level Changes

The preferred plan relies on a set of assumptions regarding fuel prices. Given the current fuel price forecasts, the preferred plan calls for the addition of substantial new solar resources in 2022-2023 and in 2031 plus gas-fired peaking generation resources in the 2029 to 2032 period. As noted previously, these resources require shorter lead times compared to larger, central station generation and provide greater flexibility for CIPCO to optimize its owned and purchased power resources to meet its system energy and demand requirements.

Higher natural gas prices may cause CIPCO to alter its fuel-choice strategy for new resource investment over the planning horizon. Any changes in the fuel type of new generation will also be influenced by factors such as the availability of new resources in CIPCO's region, expectations for future environmental regulations, and other risks associated with generation fuel or equipment types.

Additionally, substantial increases in fuel costs will increase CIPCO's avoided cost and will increase the amount of cost-effective DSM and may increase the load-side solar generation available on the CIPCO

system. This may partially mitigate the need for, or defer, new resource investments beyond those currently anticipated in the preferred plan. This is also true of any substantial increases in the capital cost of new generation.

Environmental Regulation Changes

The preferred plan incorporates current and expected future regulatory changes with regard to air, water, and soil pollution and emissions. However, future environmental regulations and enforcement inherently include some element of uncertainty. Anticipated and proposed regulations can be deferred or even eliminated through legal action or changes in policies under federal or state administrations. Likewise, environmental regulations generally tend to become more strict over time and new regulations are likely to be enacted over the 15-year planning horizon that are not currently anticipated.

CIPCO believes that its preferred plan mitigates much of the potential risk associated with future environmental regulations. Its significant portfolio of wind and solar energy along with planned solar additions and modest investment in gas-fired generation limit its exposure to more strict environmental regulations. Overall, CIPCO's supply portfolio is well positioned to effectively deal with both present and proposed environmental requirements.

Although the preferred plan is very well positioned to withstand risks from new regulations, CIPCO retains the flexibility to increase the amount of DSM offered to consumers on its system, increase future acquisitions of solar and wind energy, modify its investment in gas-fired generation, reduce the amount of coal generation, or a combination of these options.

DSM Changes

CIPCO's strong commitment to demand-side management and its extensive experience implementing DSM programs provide CIPCO with a solid foundation to meet the DSM objectives outlined in the preferred plan. However, any substantial changes in consumer acceptance of DSM measures, delivery of DSM products and programs, alternate fuel prices, CIPCO's avoided costs, technology advances, or regulatory changes such as new appliance efficiency standards or building codes, may require CIPCO to alter its planned investment in DSM activities. As noted previously, CIPCO and its member systems are currently discussing changes to the DSM program structure and member-system participation that may impact the programs offered and program delivery in the future.

Increases in CIPCO's avoided costs above the expectations in the preferred plan would allow CIPCO to increase its investment in cost-effective DSM programs and may support increased load-side generation. Cost reductions of DSM equipment or the introduction of new cost-effective technologies may allow CIPCO to increase its cost-effective DSM offerings. New energy efficiency standards may contribute to additional energy and demand savings but may eliminate certain measures from DSM programs if their benefits will be realized through consumer purchases of equipment meeting the updated standards.

Conversely, any unforeseen difficulty delivering the magnitude of DSM savings expected in the preferred plan may cause CIPCO's DSM impacts to fall below what is expected in the preferred plan. In addition, measures where fuel choices are available (such as heat pumps) may be impacted by the price of alternate fuels. Steep declines in those fuel prices may reduce the consumer's motivation for switching

to electricity as a fuel, despite the potential for overall energy-efficiency improvements. In addition, changes to tax incentives for energy efficiency upgrades may alter consumer adoption of new technologies and their impact on CIPCO's expected system demand.

Chapter 7: Action Plan

Action Items

CIPCO files an updated integrated resource plan with WAPA every five years. This chapter highlights a list of action items intended to be accomplished between now and CIPCO's next anticipated IRP filing.

The preferred plan lays out the key resource outcomes of the IRP process and the timing for implementing those actions. This chapter details the actions that CIPCO intends to take ***over the next five years (2022 to 2026)*** as part of implementing this IRP's preferred resource plan.

- CIPCO and its member systems will continue to offer the DSM programs discussed in the preferred resource plan to the extent that they remain cost-effective. CIPCO will continue to evaluate new measures, delivery mechanisms, and promotional avenues to meet or exceed the DSM goals presented in this IRP. The energy efficiency programs included in the preferred resource plan are estimated to reduce CIPCO's summer peak demand by 20 to 25 MW.
- Monitor any potential changes in tax credits for energy efficiency and on-site solar installation. Evaluate the potential impacts and incorporate those into CIPCO's long-term load forecast.
- Continue to track on-site solar installations for each member system at a class level and incorporate the impacts into the annual long-term load forecasts.
- Continue to track EV growth in Iowa and at the county level.
- Comprehensively re-assess the current portfolio of DSM programs and potential new measures and programs in 2026 and incorporate any changes into the 2027 IRP.
- Continue to explore additional opportunities in demand-response programs that aim to reduce energy use, reduce peak demand, and/or shift on-peak energy use to off-peak periods. This may include program changes to the A-2 interruptible program or mass market load management.
- Continue to acquire resources including the planned solar power resource additions in 2022-2023 and 2031. Continue to monitor prices for wind and solar power and evaluate additional opportunities to add resources while diversifying CIPCO's resource portfolio, maintaining stable future power costs, and mitigating environmental risks.
- Continue to monitor the cost-effectiveness and applicability of energy storage systems to complement CIPCO's power supply portfolio.
- Continue to monitor load growth trends and load forecast trajectories to help determine the magnitude and timing of adding small gas-fired generation.
- Monitor the potential of SIMECA and other municipals' future diesel unit changes and any deviations in municipal generation from the expectations presented in this IRP.

- Continue to invest in emissions abatement technologies and processes with its plant ownership partners where they are cost-effective and consistent with CIPCO's resource and environmental strategies.
- Continue to meet RUS guidelines of no more than one hour of outage per consumer per year through improved infrastructure, communications technologies, and maintenance activities associated with transmission and distribution systems. This metric is measured monthly and is evaluated on at least an annual basis.
- Continue to participate in regional transmission organizations that promote increased reliability, increased access to low-cost and renewable power resources, transmission system maintenance and improvements, and open access to transmission resources. These are ongoing efforts.
- Continue to monitor and evaluate CIPCO's regulatory compliance and government relations regarding state and federal environmental laws, including active participation in state and federal organizations that assist with monitoring. These are ongoing efforts.
- Monitor developments that may impact implementation of the preferred plan and adjust as necessary to meet the goals outlined in this IRP. These are ongoing efforts and are formalized in CIPCO's annual budget and financial forecast updates.

Measurement and Verification

CIPCO's resource assessment process provides a menu of options to meet the needs of its member systems while controlling costs, maintaining or improving reliability, managing price and environmental risks, and minimizing adverse environmental impacts. The preferred plan outlined in this report should be considered the baseline upon which the IRP action items will be evaluated. Measurement and verification of the actions listed in the previous section will be ongoing, with key milestones as noted in the IRP Action Plan.

CIPCO's DSM programs are evaluated to determine the achievable market potential, cost-effectiveness, consumer impacts, and overall impact on CIPCO's resource needs. CIPCO's current DSM plan includes measurement and verification processes for program performance. The impacts of active DSM programs will continue to be measured by actual participation rates and the associated energy and demand impacts based on actual measured or typical equipment performance variables. Modifications to existing programs and new measure offerings may be implemented on an ongoing basis as new information becomes available.

The timing and magnitude of new supply-side resources may be impacted by changes in the load forecast, capital or fuel prices, regulatory requirements, or other items. Potential new resources are compared to financial forecast assumptions and results and are integrated into the succeeding financial forecast update after they have been selected for implementation. This IRP includes anticipated dates for specific actions, along with estimated capacity and energy impacts of each item.

Chapter 8: Member and Public Input

CIPCO values public participation in its resource planning efforts to help guide its resource decisions and to best meet the needs of its member systems. Its member systems are involved in the resource planning process and provide input regarding the selection of resources and financial parameters. Where the impacts of resource planning go beyond the membership of its systems, CIPCO and its project development partners seek participation from the general public through information communications, meetings and forums, third party organizations, and established regulatory processes.

This chapter summarizes key elements of the member and public input for the CIPCO system. Specific meeting dates and agendas are available to WAPA upon request.

Member-System Input

CIPCO is a consumer-owned utility, comprised of 12 rural electric distribution cooperatives that are owned by their 125,000 member-owners, and SIMECA's 15 community-owned municipal utilities. CIPCO's consumer-owned member systems provide input to CIPCO's strategic direction through participation in Board and management meetings. Each of CIPCO's member systems is, in turn, owned by their consumers who provide input and direction to their systems either directly or through elected or appointed representatives. In this manner, a broad population has direct or indirect input into CIPCO's management decisions and strategic direction.

CIPCO conducts a survey of residential consumers every three to four years to assess changes in appliance holdings, adoption of energy-efficiency measures, and consumers' fuel choice preferences. These surveys also gather selected data regarding members opinions on energy policy topics, renewable power, and interest in on-site solar and electric vehicle purchases. This information, collected from a sample of 4,000 to 5,000 residential consumers, helps guide CIPCO's load forecasting and DSM planning processes which are direct inputs into the IRP analyses. Selected data collected in the surveys were presented in this report.

CIPCO works closely with its member systems in the evaluation, selection, and implementation of demand-side resources. Since CIPCO does not directly serve any retail consumers, coordination with its member systems regarding DSM implementation and delivery is critical to achieve successful results and meet demand-side resource goals. CIPCO's member systems provide input into demand-side planning and are actively involved in its implementation and success. DSM-related activities of CIPCO and its member systems are discussed in depth at quarterly member service meetings and additional monthly touchpoints. High-level discussions take place, as necessary, at quarterly manager meetings and monthly CIPCO Board meetings.

CIPCO's Board of Directors is actively involved in CIPCO's overall financial planning process, the selection of supply-side resources, and any material changes to existing resources. Major investments and changes in both demand-side and supply-side strategies are approved by CIPCO's Board. CIPCO's Board of Directors, representing its member-systems, has approved this Integrated Resource Plan as documented in Chapter 9 of this report.

CIPCO Member Cooperatives and Local Contractors - Momentum Is Building

Momentum Is Building (MIB) is an annual energy-efficient home building conference sponsored by Iowa's electric cooperatives. MIB offers an opportunity to gain insight into new techniques from nationally known speakers, see the latest building products offered by vendors and network with other building, electric and HVAC professionals. Support for the conference comes from Iowa's rural electric cooperatives and a grant from the Iowa Energy Center.

Momentum Is Building offers up-to-date building science information, practical hands-on information and new technology displays for building trades professionals – including homebuilders, electricians and heating/plumbing contractors. Rural electric cooperative personnel from across the state also attend.

Nationally-recognized speakers share their knowledge on topics including trends and commonly asked questions in energy-efficient building, equipment (e.g., lighting, ventilation systems, plumbing systems) and a number of trade-specific regulations (e.g., the Uniform Plumbing Code, International Mechanical Code, National Electrical Code, and International Energy Efficiency Code). Several sessions offer Continuing Education Units (CEU) that are required for licensing in the electrical, mechanical, and plumbing disciplines.

MIB is celebrating 30 years in 2022. More information including past conference agendas can be found at http://www.momentumisbuilding.com/.

CIPCO's commitment to energy efficiency initiatives extends to its membership in various organizations. The Iowa Association of Energy Efficiency works to promote energy efficiency operations throughout the state, and CIPCO has a seat on the board. CIPCO's work with the Iowa Geothermal Association allow for the promotion and growth of issues related to the industry. Finally, CIPCO is a member of the Midwest Rural Energy Council, a multi-state organization focused on supporting outreach, education and research related to rural energy issues, and CIPCO maintains a seat on this board as well.

General Public Input

Although CIPCO's ownership structure allows for direct and indirect input from its member systems, some resource decisions by CIPCO impact the general public beyond its ownership. This is especially true of new generation and transmission resource planning and development but can also be true for public outreach regarding electric safety, energy efficiency, and economic development.

CIPCO and/or its agents (including partners in the construction, ownership and operation of jointly-owned power plants and transmission facilities) have and will continue to seek and provide opportunities for direct public participation as new supply-side resources are planned, proposed and move through the necessary jurisdictional approval processes. This is true of the new generation resources included in the Preferred Plan.

CIPCO and any partners involved in development of new generation or transmission infrastructure impacting the general public will engage the public through information dissemination, public meetings and forums, regulatory processes, and other avenues that are typically available as part of resource

development. These public input opportunities will gather and share public information, seek to identify key concerns of the public, and respond to those comments and concerns. Some of these activities will be coordinated directly by CIPCO, while others will involve project partners, regional planning organizations, or regulatory bodies at the state or county level.

A recent example of public input was the series of meetings and opportunities for public comments regarding the proposed Coggon Solar facility that is a key component of CIPCO's resource plan. The following meetings provided opportunities for public input:

- Linn County Planning and Zoning meeting on November 29, 2021
- Linn County Board of Supervisors meeting on January 10, 2021
- Linn County Board of Supervisors meeting on January 13, 2021
- Linn County Board of Supervisors meeting on January 18, 2021
- Linn County Board of Supervisors meeting on January 24, 2021

Plans were discussed and revised through this series of meetings, taking into consideration the input of public speakers, meeting attendees, and the decisionmakers. This process ultimately resulted in the approval of land re-zoning for the project with modifications and conditions to the original proposal.

Chapter 9: Approval

The 2022 Integrated Resource Plan herein was reviewed by CIPCO's member system managers and approved by its Board of Directors. The Board resolution approving this IRP, dated March 1, 2022, is included on the following page.

IOWA 83 CEDAR RAPIDS

CERTIFICATE

I, Gene Manternach, do hereby certify:

That I am the duly elected, qualified and acting Secretary-Treasurer of CENTRAL IOWA POWER COOPERATIVE (hereinafter called the "Cooperative") and the keeper of its records; that at a regular meeting of the Board of Directors of the Cooperative with a quorum of directors present in person, held March 1, 2022, the following resolution was adopted:

WHEREAS, the Energy Policy Act of 1992, Public Law 102-486 Section 114, Title II-Integrated Resource Planning required by the Department of Energy to develop, promulgate, and enforce rules requiring Power Marketing Authorities to implement integrated resource planning; and,

WHEREAS, Department of Energy, 10 C.F.R. Part 905, Energy Planning and Management Program rules require Power Marketing Authority (hereinafter PMA) customers to file Integrated Resource Plans; and,

WHEREAS, the Western Area Power Administration (hereinafter WAPA) is a PMA; and,

WHEREAS, the Cooperative is a WAPA customer, and must comply with these rules; and,

WHEREAS, this Member-Based Association (hereinafter MBA) filing by Cooperative represents the collective interests of the individual member utilities it serves including: Clarke Electric Cooperative, Inc.; Consumers Energy; East-Central Iowa Rural Electric Cooperative; Eastern Iowa Light and Power Cooperative; Farmers Electric Cooperative, Inc.; Guthrie County Rural Electric Cooperative Association; Linn County Rural Electric Cooperative; Maquoketa Valley Electric Cooperative; Midland Power Cooperative; Pella Cooperative Electric Association; South Iowa Municipal Electric Cooperative Association (SIMECA) representing the Iowa municipals of Bellevue, Brooklyn, Cascade, Corning, Durant, Earlville, Fontanelle, Gowrie, Greenfield, Lamoni, Lenox, Orient, Stuart, Villisca, and Winterset; Southwest Iowa Rural Electric Cooperative (including Stanton); and T.I.P. Rural Electric Cooperative.

NOW THEREFORE BE IT RESOLVED, that the Cooperative approve the WAPA IRP Report dated March 1, 2022; and,

BE IT FURTHER RESOLVED, that the Cooperative file the WAPA IRP Report with WAPA as an MBA.

That said resolution has not been amended, altered, rescinded, or modified, and is presently in full force and effect.

IN WITNESS WHEREOF, I have executed this certificate and attached a corporate seal of the Cooperative this 1st day of March A.D., 2022.

Gene Manternach
Secretary-Treasurer

(CORPORATE SEAL)