California Energy Commission
May 8, 2025 Business Meeting
Backup Materials for Agenda Item No X: Application for 2022 Energy Code Residential Automated Window Shading Exceptional Method

The following backup materials for the above-referenced agenda item are available as described below:

1. Proposed Order, attached below.
2. Recommendation of the Executive Director on Application for 2022 Energy Code Residential Automated Window Shading Exceptional Method, attached below.
3. ConSol's Complete Application for Automated Window Shading Exceptional Method available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=260208&DocumentContentId=96436

For the complete record, please visit: California Energy Commission: Docket Log 24-BSTD-04.

To stay informed about this project and receive documents as they are filed, please subscribe to the proceeding Topic, which can be accessed here: California Energy Commission: Docket Log 24-BSTD-04. The Topic sends out email notifications and direct links when documents are filed in the proceeding docket.

ORDER NO: 25-0508-xx

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

IN THE MATTER OF:	**Docket No.: 24-BSTD-04**
Application for 2022 Energy Code Residential Automated Window Shading Exceptional Method	**PROPOSED ORDER DENYING THE APPLICATION FOR EXCEPTIONAL METHOD**

I. INTRODUCTION AND PROCEDURAL HISTORY

The 2022 Energy Code regulations contained in the California Code of Regulations (CCR), Title 24, Parts 1 and 6, which became effective January 1, 2023, establish the opportunity, in Section 10-109, for the California Energy Commission (CEC) to approve an exceptional method that provides new designs, materials, or devices that are not currently modeled adequately in the approved alternative calculation methods for newly constructed buildings and additions and alterations to existing buildings. Applications must include all information necessary to verify the exceptional method's accuracy. The intent of exceptional methods is to encourage market innovation and provide the CEC the ability to respond to market needs.

On July 23, 2024, ConSol submitted an exceptional method application to the California Energy Commission (CEC) in accordance with Section 10-109(e) of the 2022 Energy Code. The application requests incorporation of automated window shades in the 2022 California Building Energy Code Compliance - Residential (CBECC-Res) software.

CEC staff worked closely with the applicant to refine their application, and after a lengthy review of the final application along with the supporting documentation, staff has found the application to be complete. The CEC considered the Application at its May 8, 2025, Business Meeting.

II. CALIFORNIA ENERGY COMMISSION FINDINGS

Based on the entirety of the record, the CEC finds that:

1) ConSol submitted an application to Docket No. 24-BSTD-04 on July 23, 2024, requesting an Exceptional Method for Residential Automated Window Shading under Section 10-109(e) of the 2022 Energy Code.

2) The Application meets the requirements in Section 10-109(e) of the 2022 Energy Code.

3) Section 10-110 of the 2022 Energy Code requires that once an application is determined to be complete, the Executive Director of the CEC shall make the application package available for public review for at least 15 days. On November 26, 2024, the CEC provided a copy of the application to interested persons, provided an opportunity for public comment for 17 days, and considered all public comments received in developing the Executive Director's recommendation.

4) Section 10-110 requires the Executive Director to consider the complete application package, and any additional submitted information, and make a recommendation to the CEC on the application. The Executive Director reviewed the staff analysis and on April 25, 2025, submitted a recommendation to the CEC to deny the application.

5) The CEC has considered the Executive Director's recommendation and all relevant information regarding the application and finds that, at this time, the energy savings for California from this exceptional method are likely to be minimal, and do not warrant the requisite increase in complexity of the CBECC-Res software.

III. CONCLUSION AND ORDER

1) For the reasons stated above, the CEC hereby DENIES ConSol's Application for a 2022 Energy Code Residential Automated Window Shading Exceptional Method.

2) The CEC delegates the authority and directs CEC staff to take, on behalf of the CEC, all actions reasonably necessary to carry out the above direction.

3) Denial of this application is not a project, as defined, subject to the California Environmental Quality Act (CEQA).

4) Any interested person may obtain a copy of the application by accessing TN# 260208 at docket number 24-BSTD-04.

IT IS SO ORDERED.

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of an order duly and regularly adopted at a meeting of the CEC held on May 8, 2025.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

_____
Kristine Banaag
Secretariat

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

MEMORANDUM

TO: CALIFORNIA ENERGY COMMISSION

FROM: DREW BOHAN
EXECUTIVE DIRECTOR
CALIFORNIA ENERGY COMMISSION
715 P STREET
SACRAMENTO, CALIFORNIA 95814

SUBJECT: CEC EXECUTIVE DIRECTOR RECOMMENDATION TO DENY APPLICATION FOR 2022 ENERGY CODE RESIDENTIAL AUTOMATED WINDOW SHADING EXCEPTIONAL METHOD

DATE: APRIL 25, 2025

BACKGROUND

The 2022 Energy Code regulations contained in the California Code of Regulations (CCR), Title 24, Parts 1 and 6, which became effective January 1, 2023, establish the opportunity, in Section 10-109, for the California Energy Commission (CEC) to approve an exceptional method that provides new designs, materials, or devices that are not currently modeled adequately in the approved alternative calculation methods for newly constructed buildings and additions and alterations to existing buildings. Applications must include all information necessary to verify the exceptional method's accuracy. The intent of exceptional methods is to encourage market innovation and provide the CEC the ability to respond to market needs.

On July 23, 2024, ConSol submitted an exceptional method application to the California Energy Commission (CEC) in accordance with Section 10-109 of the 2022 Energy Code. The application requests incorporation of automated window shades in the 2022 California Building Energy Code Compliance - Residential (CBECC-Res) software.

CEC staff worked closely with the applicant on their application, and after a lengthy review of the final application along with the supporting documentation, staff has found the application to be complete. CEC staff analyzed the application and recommended denial of the application so that the exceptional method can be more thoroughly evaluated for a future code cycle or version of the CBECC-Res software. After reviewing staff's recommendation, I agree with their conclusion and recommend that the Commission consider and deny ConSol's application at the Commission's May 8, 2025 business meeting.

SEQUENCE OF EVALUATION

- On July 23, 2024, ConSol submitted an application to the CEC requesting incorporation of automated window shades in the 2022 CBECC-Res software under the 2022 Energy Code.
- Staff determined the application to be complete. Pursuant to Title 24, section 10-109, a public notice was posted to docket number 24-BSTD-04.[1] The notice provided an opportunity for public comment, and any comments received by December 13, 2024, were considered. Three comments were received.
- Staff reviewed all information received in the complete application and concludes that ConSol has met the applicable requirements for submitting an application in the 2022 Energy Code. Staff summarized their findings in the Residential Automatic Window Shading Exceptional Method Staff Report, attached to this recommendation as Appendix A.

CONCLUSION AND RECOMMENDATION

Pursuant to the 2022 Energy Code, section 10-109, and consistent with CEC's staff's analysis and recommendation, I recommend the CEC deny the 2022 Exceptional Method application for residential automated window shading.

Drew Bohan
Executive Director
California Energy Commission

Date: April 23, 2025

[1] Available at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=24-BSTD-04

APPENDIX A:
Residential Automated Window Shading Exceptional Method Staff Report

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

STAFF REPORT

Residential Automated Window Shading Exceptional Method

May 2025 | CEC-400-2025-XXX

California Energy Commission

Thao Chau
Primary Author

Thao Chau
Project Manager

Nikhil Kapur
Unit Supervisor

Gypsy Achong
Branch Manager
BUILDING STANDARDS BRANCH

Will Vicent
Deputy Director
EFFICIENCY DIVISION

Michael J. Sokol
Director
EFFICIENCY DIVISION

Drew Bohan
Executive Director

ABSTRACT

On July 23, 2024, the California Energy Commission (CEC) received an application for adding an exceptional method for automated window shades in single-family housing projects in accordance with Section 10-109 of the *2022 Building Energy Efficiency Standards* (2022 Energy Code.) This application includes a request to incorporate these automated window shades as a compliance option in the California Building Energy Code Compliance software — residential (CBECC-Res).

CBECC-Res is a CEC-approved software for demonstrating performance compliance with residential provisions of the 2022 Energy Code. Performance modeling allows a user to assess building system performance of different building components compared with the Energy Code baseline. Currently, automated window shades are not an option for modeling in CBECC-Res. The exceptional method applicant is proposing using the exceptional method for the inclusion of these shades for performance compliance credit.

CEC staff solicited public comment on the application and received three comments requesting incorporation into CBECC-Res of this automated window shading option. After thorough review of the application package and the submitted comments, staff finds that the energy savings for California from this exceptional method are likely to be minimal and do not warrant the requisite increase in complexity of the CBECC-Res software. Therefore, this staff report recommends denying the application for adding automated window shades as an exceptional method.

Keywords: California Energy Commission, Building Energy Efficiency Standards, 2022 Energy Code, California Building Energy Code Compliance — Residential, CBECC-Res, compliance software, automated window shades, exceptional method

Please use the following citation for this report:

Chau, Thao. 2025. *Residential Automated Window Shading Exceptional Method*. California Energy Commission. Publication Number: CEC-400-2025-XXX.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

On July 23, 2024, ConSol, the applicant, submitted an exceptional method application to the California Energy Commission (CEC) in accordance with Section 10-109(e) of the *2022 Building Energy Efficiency Standards* (2022 Energy Code). The application requests incorporation of automated window shades in the 2022 California Building Energy Code Compliance — Residential (CBECC-Res) software.

Automated window shades are shading materials applied to exterior or interior windows or both that are controlled electronically according to user-defined schedules. Well-positioned shades can potentially reduce the internal loads, or energy demands, of a building where these shades are installed and therefore can reduce energy use. Cooling load can be reduced when shades are down in the summer and solar heat can be gained when shades are up in the winter.

CEC staff has worked closely with the applicant to refine their application, and after a lengthy review of the final application, along with the supporting documentation, staff has found the application to be complete. However, based on the analysis, staff finds that the energy savings for California from this exceptional method are likely to be minimal and do not warrant the requisite increase in complexity of the CBECC-Res software. Therefore, staff recommends denying this application.

CHAPTER 1: Introduction

Exceptional Methods

The California Building Energy Efficiency Standards (2022 Energy Code) defines an exceptional method as a method for estimating the energy performance of building features that cannot be adequately modeled using existing Compliance Software and that is approved by the executive director. Under Section 10-109(e) of the 2022 Energy Code, the California Energy Commission (CEC) may approve an exceptional method that provides new designs, materials, or devices that are not modeled adequately in the approved alternative calculation methods for newly constructed buildings and additions and alterations to existing buildings. Applications must include all information necessary to verify the accuracy of the exceptional method. Exceptional methods aim to encourage market innovation and provide the CEC the ability to respond to market needs.

Application for Residential Automated Window Shades

The exceptional method application received for residential automated window shades requests CEC to adjust the 2022 California Building Energy Code Compliance — Residential (CBECC-Res) software to incorporate the ability to model these shades and provide energy performance credits based on analyzed results for buildings in which these shades are installed. The application package provides complete modeling details for these shades within CBECC-Res.

Automated Window Shades

What Are Automated Window Shades?

Automated window shades are shading materials applied to exterior, interior windows, or both that are controlled electronically according to user-defined schedules. Well-positioned shades can potentially reduce the internal loads of a building where these shades are installed and therefore can reduce energy use. Cooling load can be reduced when shades are down in the summer, and solar heat can be gained when shades are up in the winter. Depending on daylighting needs, properly automated shading theoretically can balance the solar heat gain across all seasons for buildings. Manufacturers' preset operating schedules are user-modifiable via mobile or computer applications. The industry warranties are typically 10 years for the shade materials and five years for the motors.

Current Modeling Limitation

CBECC-Res does not allow automated window shade as a user input. Instead, the software has a built-in assumption for insect screens, which provide minimal shading. No automation is accounted for. There is a default operation schedule for interior shades. It is not currently possible to model exterior shades operating on a schedule.

Modifications to California Simulation Engine (CSE)

The underlying energy simulation engine for CBECC-Res is the California Simulation Engine (CSE). To calculate energy savings from automated window shades in a home, modifications to the CSE are required. Modifications include the ability to install the window shades on the interior or exterior of the building (or both) and the ability to control these shades based on a set schedule.

CSE Results From Proposed Residential Automated Window Shades

The energy impacts of automated window shades are studied using single-family building prototypes. 2,100 square-foot and 2,700 square-foot homes have been used to analyze proposed measures for the last few Energy Code cycle updates. Table 1 summarizes the characteristics of these building prototypes.

Table 1: Single Family-Building Prototypes

# of Stories	Total Sqft	Description
1	2,100	1-story detached single-family home with an attached garage, slab-on-grade foundation, wood-framed wall construction, and a vented attic.
2	2,700	2-story detached single-family home with an attached garage, slab-on-grade foundation, wood-framed wall construction, and a vented attic.

Source: California Energy Commission staff

The energy performance results for the prototypes with automated window shades are compared with the results from the same prototypes with default windows, that is, without automated window shades. The performance of both interior and exterior window shades is evaluated. For interior window shades, three window installations are considered: all west-facing windows, all south-facing windows, and both west- and south-facing windows. Each scenario is simulated in all 16 climate zones.

Cooling energy listed is the sum of both heating, ventilation, and air conditioning (HVAC) and fan energy usage during the cooling season. Similarly, heating energy is the sum of HVAC and fan energy during the heating season. Cooling and heating energy consumption for all scenarios with automated window shades is compared with the respective scenario where no automated window shades are installed.

Interior Shades Modeling

Interior Shades Modeling Method

The default insect screen fabric characterized by 0.11 transmittance and 0.38 reflectance is replaced by 2410+ Charcoal/Gray Fabric from Phifer with 0.04 transmittance, and 0.72 reflectance.

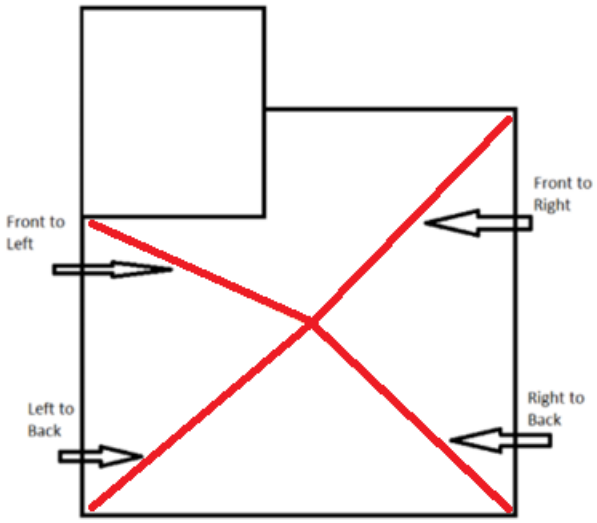
Interior window shades were modeled with automation and compared to the default CBECC-Res shade schedule. The default CBECC-Res schedule for window shades assumes both:

- 80 percent closed.
- 50 percent closed if the diffuse radiation exceeds 1 British thermal unit (Btu)/hour/square foot on the windows.

For scenarios with automation, the shade operating schedules are modified based on the Attachments Energy Rating Council (AERC). These schedules leave the shades fully open during November, December, January, and February and keep the shades fully closed during the remaining months of the year.

To separate the energy impacts of the shades from the other windows, the thermal zones in each of the building protypes were divided into four triangular zones, as shown in Figure 1.

Figure 1: Multizone Configuration

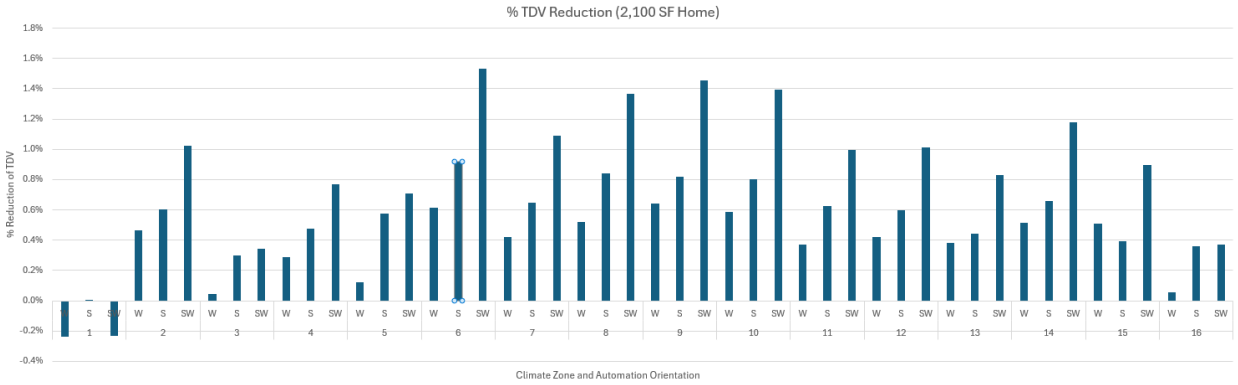


Credit: *ConSol*

Interior Shades Performance

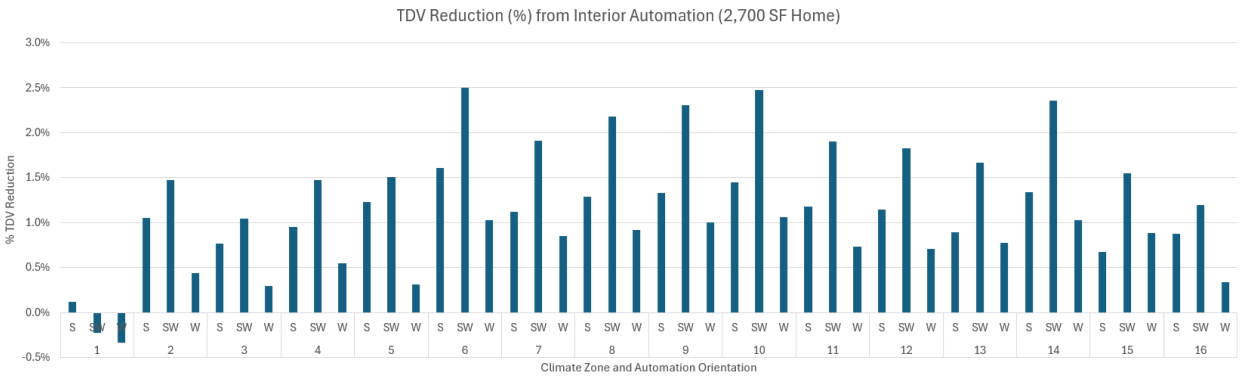
Figures 2 and 3 show the time-dependent value (TDV) impacts for each window configuration (south, southwest, and west) using automation compared with the default scenario in all 16 climate zones for the 2,100 square-foot home and 2,700 square-foot home, respectively. The largest saving is about 2.5 percent of total TDV for both prototypes across all window orientations.

Figure 2: TDV Impacts of Automation on Interior Shades for 2,100 square-foot Prototypes (%)



Credit: ConSol

Figure 3: TDV Impacts of Automation on Interior Shades for 2,700 square-foot Prototypes (%)



Credit: ConSol

Exterior Shades Modeling

Exterior Shades Modeling Method

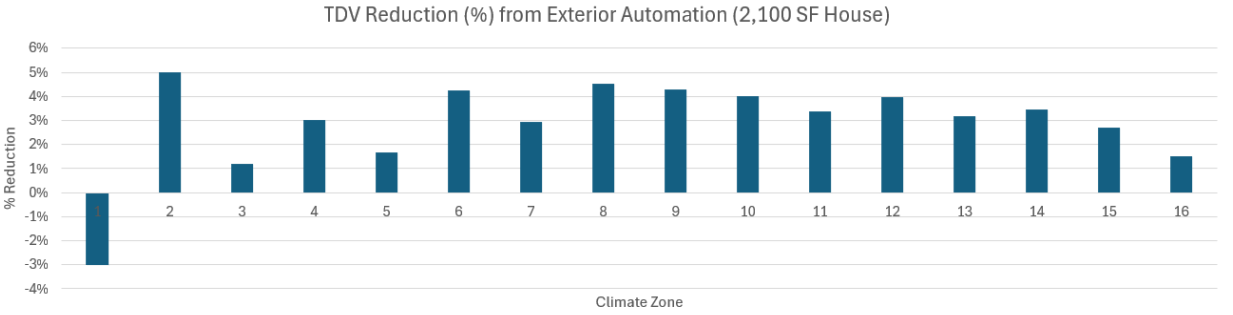
Exterior shades are assumed to be applied to all windows and are fully closed during the cooling season (April through October) and fully open during the heating season (November through March), based on AERC schedules.

Similar to the approach for interior shades modeling, the exterior shades replace the exterior insect screens (transmittance of 0.06 and reflectance of 0.03) using SunTex 95 Carbon product (transmittance of 0.1 and reflectance of 0.01).

Exterior Shades Performance

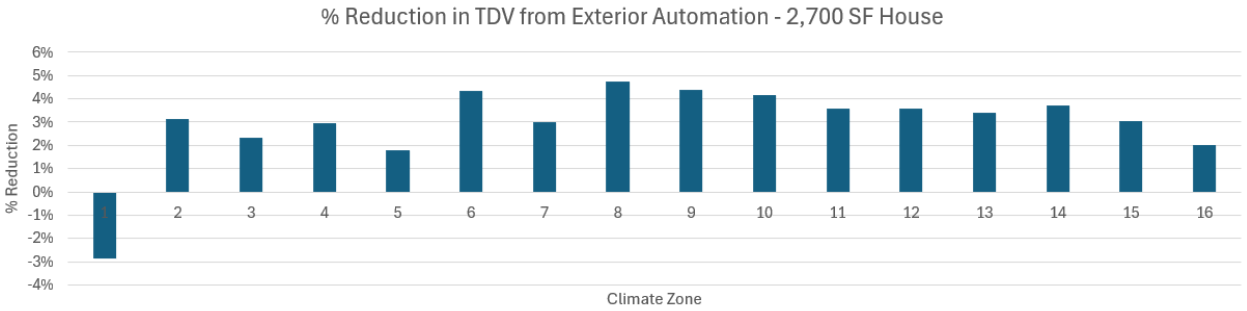
Figures 4 and 5 show the net impacts in TDV values for the 2,100 square-foot prototype and 2,700 square-foot prototype, respectively. In both prototypes, TDV value increases in Climate Zone 1 and decreases in the other 15 climate zones. The largest saving is about 5 percent of total TDV for both prototypes.

Figure 4: TDV Impacts of Exterior Shades for 2,100-Square-Foot Prototype (%)



Credit: ConSol

Figure 5: TDV Impacts of Exterior Shades for 2,700-Square-Foot Prototype (%)



Credit: ConSol

CHAPTER 2:
Staff Evaluation

After working closely with ConSol to refine the application and carefully reviewing the request and the provided simulated results, CEC staff concludes that the energy savings for California from this exceptional method are likely to be minimal. The building prototype analysis shows minimal heating and cooling savings and energy savings for the entire buildings. Further, there is uncertainty about how consumer behavior may impact the energy savings from this measure.

Review of the Residential Automated Window Shades Analysis

The analysis of the residential automated window shades for residential buildings in CBECC-Res was carefully and thoroughly studied. The TDV reductions shown for interior and exterior shading in both prototypes across all the climate zones maxed out at 5 percent. The TDV savings are calculated for a year (8760 simulated hours). These savings are likely to vary across buildings because of variability in consumer behavior.

CEC staff identifies two areas of uncertainty related to the energy savings from residential automated window shades:

- Replacement timing
- Durability of optimized automated settings

Typical industry warranties are 10 years for the shade materials and five years for the motors. At the end of life of either of these components, a homeowner may decide to switch to an alternative window treatment or, once the motor fails, operate the shades without automation. To develop an exceptional method for these automated window shades, staff would need to apply a discount to reasonably address the 30-year expected building lifetime energy savings of this measure.

Furthermore, there is no current procedure to ensure proper installation of the shades and that automation settings optimized for energy savings are durable. As such, staff would need to apply a discount for improperly installed shades and nonideal schedules.

Conservatively addressing these concerns in CBECC-Res would result in performance credits that would be much lower than the original savings shown in the analysis submitted with ConSol's application. Therefore, staff finds the savings from this exceptional method to be significantly less than the savings indicated by the applicant. Further, incorporating this exceptional method will increase the complexity of the CBECC-Res user interface. As a result of the minimal savings and the increased complexity of the software from adding this exceptional method, CEC staff recommends denying the application for an exceptional method.

Public Review of the Exceptional Method

In accordance with Section 10-110(b) of the 2022 Energy Code, the residential automated window shades exceptional method application was posted for public review with a 15-day comment period, which closed December 13, 2024. The three comments received during this period were supportive of approval for the exceptional method application. Since CEC staff is recommending denial of this application, no workshop was held after the comment period.

CHAPTER 3:
Conclusion

The application for an exceptional method submitted by ConSol for residential automated window shades is complete. However, based on the CEC staff's analysis, staff finds that the energy savings for California from this exceptional method are likely to be minimal, and do not warrant the requisite increase in complexity of the CBECC-Res software. Therefore, staff recommends denying this application.

GLOSSARY

Attachments Energy Rating Council (AERC). An independent, public interest, non-profit organization whose mission is to provide consumers with credible, relevant, and comparable information about window attachments and their performance. AERC serves the public interest by providing accurate and credible information about the energy performance of window attachments, which will help consumers, including homeowners, architects, and builders, make informed decisions about window attachment products.

California Simulation Engine (CSE). A general purpose building simulation model developed primarily to perform the required calculations for the California Building Energy Code Compliance for Residential buildings (CBECC-Res) software

Exceptional method. A method for estimating the energy performance of building features that cannot be adequately modeled using existing Compliance Software and that is approved by the Executive Director.

Reflectance. The reflectance of light at wavelengths from 410 to 722 nanometers.

Time-dependent value (TDV) energy. The time varying energy caused to be used by the building to provide space conditioning and water heating and for specified buildings lighting. TDV energy accounts for the energy used at the building site and consumed in producing and in delivering energy to a site, including, but not limited to, power generation, transmission and distribution losses.

Transmittance. The ratio (expressed as a decimal) of visible light that is transmitted through a glazing fenestration. The higher the VT rating, the more light is allowed through a window.