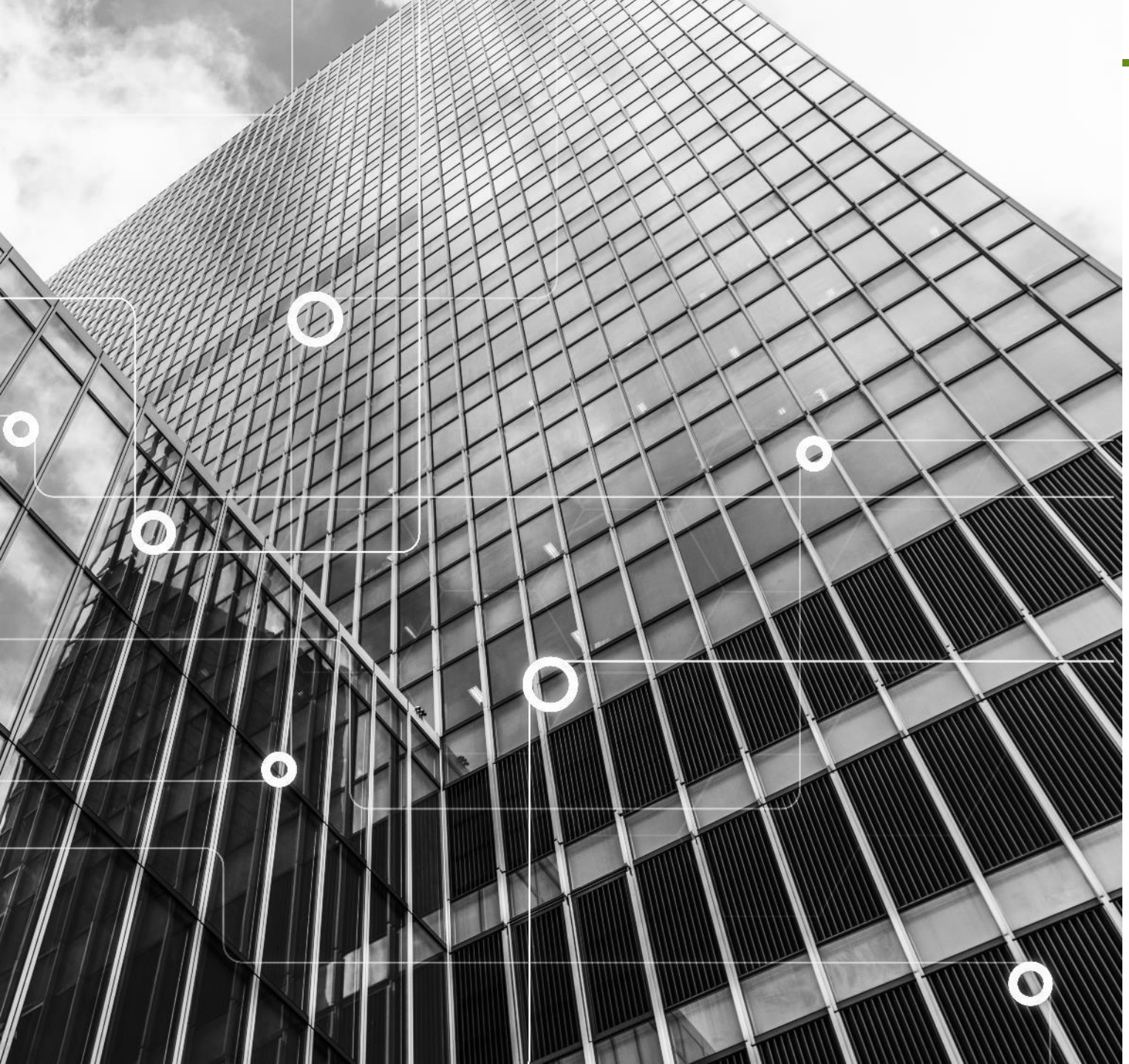

Instant Lighting Incentive Program (ILIP) Evaluation

Presented to Con Edison

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Executive Summary

Program and Evaluation Overview

› The 2018 program's goals were to achieve cost effective energy savings and decrease barriers to participation.

› The 2018 evaluation goals were to complete a thorough review of the tracking database and estimate gross energy and demand savings.

Key Evaluation Challenges

› The key evaluation challenges identified were:
  – Customer awareness and memory
  – Returned bulbs
  – Savings uncertainty

Key Impact Findings

› The program's 2018 realization rates are 74% for energy and 85% for demand.

› Key realization rate drivers include in service rate, hours of use, and measure location.

Conclusions and Recommendations

› Improve program communication

› Clarify program documentation

› Adjust savings parameters

Table ES-1. Con Edison Instant Lighting Incentive Program Savings

Savings Type	Ex Ante Savings	Ex Post Gross Savings	Realization Rate	Relative Precision at 90% Confidence
Energy (kWh)	55,050,307	40,782,631	74%	11.5%
Demand (kW)	10,956	9,323	85%	7.8%

Program and Evaluation Overview

- Program Summary
- Evaluation Objectives
- Evaluation Methods

01

Program Description

The program targets large commercial customers with point-of-sale rebates.

The Instant Lighting Incentive Program is available to separately-metered customers on **commercial rates**. It provides point-of-purchase discounts for eligible customers (those with average metered demand above 300kW). Customer eligibility for the program is determined by customer address, and confirmed by the participating distributor.

Customers are **required to install bulbs** purchased through the program within 30 days of purchase.

Program Goals

The goals of the program reflect the need for streamlined programs and increased cost-effectiveness.

The ILIP program has two primary goals:

1. Achieve **cost-effective** energy and demand electricity savings.
2. **Decrease barriers** to participation through reduced paperwork and point-of-sale rebates.

Savings Targets

The program had aggressive savings targets in 2018, which was its first year of implementation.

The program started in **April 2018**.

CLEAResult initially estimated that the program would provide **101,909 MWh** of energy savings and **20.3 MW** of demand savings during the 2018 program year.

Program Participation

ILIP achieved substantial participation and ex ante energy savings in 2018.

A total of **941 unique customers** participated in the ILIP program in 2018, representing 3,041 total invoice lines, and a total of 357,246 individual lamps or bulbs.

The ILIP provided **55,050 MWh** of ex ante energy savings and **11.0 MW** of ex ante demand savings during the first year of the program.

This represents approximately 55% of predicted savings for both energy and demand.

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Evaluation Objectives

Evaluate Gross Savings

There are three main uses for the gross savings evaluations:

1. Meet regulatory requirements.
2. Improve the accuracy of program savings estimates for planning
3. Verify installation, hours of use, coincidence factors, and estimates of HVAC interactive effects

Review Tracking Database

During the tracking database review, Navigant identifies potential improvements to better meet regulatory, program implementation, and evaluation needs.

Navigant performed a review of the tracking database in November 2018 and sent a memo to Con Edison. The review of the final 2018 program database did not produce any additional notes.

Based on sampling assumptions to achieve 10% precision at 90% confidence, Navigant targeted an initial sample of 66 projects, drawn continuously over the course of the program year, to receive an on-site verification.

The evaluation team conducted continuous project evaluations for the Instant Lighting Incentive Program, which included confirming measure installations and baseline technologies, estimating hours of use and coincidence factors, and estimating HVAC interactive effects.

New York's Evaluation, Measurement, and Verification Guidance specifies minimum confidence and precision levels for verification activity. Navigant's sampling plan was designed to meet these requirements, with the ILIP evaluation targeting 90/10 confidence/precision annually.

The program implementer initially forecast a total savings of 101,909 MWh by the end of the program year in 2018. Using this forecast, and an extract of participation data through April 2018, also provided by the implementer, Navigant stratified the program into Large (>300,000 kWh), Medium (100,000-300,000 kWh) and Small (<100,000 kWh) projects. This led to an anticipated sample size of 66 over the course of the year, assuming an equal sample for each of the strata.

Using this estimate of project counts and savings, Navigant created a sample design targeting realization rate results at 90% confidence with 10% relative precision for ILIP overall. The sampling stratification and targeted sample sizes were updated over the course of the program year to ensure that the final year-end values achieve the targeted precision. Navigant used a coefficient of variation (CV) of 0.5 based on prior work on similar programs, and added sites at the end of the year when the actual CVs proved higher.

All sampled projects received a verification site visit. These visits for sampled projects were performed by TRC, a local QA/QC contractor, and the resulting data was reviewed by Navigant staff.

Evaluation Challenges

› Evaluation Challenges

02

The inherent evaluation challenges present in midstream programs contribute to reduced realization rates and increased CVs compared with standard downstream programs. These tradeoffs are usually worthwhile given the higher participation that midstream programs can achieve.

Customer Awareness

During site visit scheduling, TRC reported that many of the customers in the ILIP database were not aware they were participating in a program at all.

While this indicates that ILIP achieved its second goal – reducing barriers to participation – it makes evaluating the program more difficult.

Customer Memory

During the site visits, TRC found it difficult to track bulbs purchased through the program. Customers often did not remember where they installed the program bulbs, or which bulbs they purchased at which time.

Larger customers may purchase several thousand bulbs over the course of several months.

Returned Bulbs

Program rules require customers to return bulbs they do not install within 30 days. This makes determining ex ante counts difficult.

One site included in the on-site sample bought bulbs in 2018, then returned them in 2019. This case, and its affect on the program results, is detailed in section 3 of this report.

Inherent Unknowns

Upstream/midstream programs like the ILIP involve inherent uncertainty. Using a single Hours of Use (HOU) and Coincidence Factor (CF) for each bulb means that no site will have a 100% realization rate, and the resulting spread in the realization rate often results in high coefficients of variation for midstream lighting programs.

Key Impact Findings

- Database Review
- Realization Rates
- Case Studies
- Precision

03

Navigant found that the TRM algorithms were correctly applied, but recommend updating the hours of use (HOU), coincidence factors (CF), and HVAC interaction factors (HVACc, HVACd) for the ILIP.

Navigant reviewed the reported savings for Con Edison's ILIP via a thorough database review.

Based on this review, Navigant recommended modifying three elements of the energy and demand savings algorithms: annual HOU, energy interaction factor, and demand interaction factor.

After completing the full evaluation with additional verification visits, Navigant recommends additional updates to these values.

The variety of building, HVAC, and schedule types found in the verification differed from that in the data sources Navigant utilized in their initial database review. These updated values and a comparison to the current values being used are given in Table 3-1, below. Navigant also recommends using a CF of 0.91, to account for exterior lighting installations.

Using these values to inform ex ante savings estimates for future program years will likely lead to a more accurate savings estimate for ILIP.

Table 3-1. Navigant Calculated Inputs for TRM Algorithms

Stratum	HVACc	HVACd	Annual HOU	CF
CLEAResult Assumption	0	0	5,034(Screw in) or 4,907(LF)	1
Navigant Recommendation Based on Full Evaluation	-0.045	0.160	4,515	0.91

Navigant compared the verified savings both to the ex ante reported values (from the year end data) and the Navigant update of the reported savings based on Navigant's review of the first year savings.

Table 3-2. ILIP Savings Summary: Ex Ante versus Ex Post

Savings Type	Ex Ante Savings	Ex Post Savings
Energy (Annual kWh)	55,050,370	40,782,631
Coincident Demand (kW)	10,956	9,323

74%
Energy Realization Rate

85%
Demand Realization Rate

Table 3-3. ILIP Savings Summary: Suggested Ex Ante versus Ex Post, Without ISR applied

Savings Type	Future Ex Ante Savings	Ex Post Savings
Energy (Annual kWh)	48,436,747	40,782,631
Coincident Demand (kW)	11,468	9,323

84%
Energy Realization Rate

81%
Demand Realization Rate

The realization rates differ from 1.0 for several reasons, most notably factors that affect the calculation parameters of in service rate, hours of use, and coincidence factor.

In Service Rate

The primary driver for the ILIP realization rate is ISR: customers do not install all the bulbs bought through the program, and do not return all of those not installed. Customers indicate that they are keeping these additional bulbs as spares, or are replacing old bulbs as they burn out. The actual ISR was 87% for the evaluated projects.

Hours of Use

While custom HOU information was not available for all locations, HOU were generally lower than those used by the implementer, and slightly higher than those suggested by Navigant. Where building-specific HOU was not available, Navigant relied on the deemed values provided by the TRM. Actual HOU for the program was 4,515.

Installation Location

Early in the program, several customers installed the purchased bulbs within the apartments of large multifamily buildings. This resulted in a very low HOU value (1,168 rather than 5,034) and a CF of 0.082, rather than 1.0.

Multiple locations installed bulbs outside, reducing CF to 0.

Overall verified CF for the program was 0.91.

Four example projects demonstrate the effects of the realization rate drivers on overall program results. Removing the four projects from the analysis leads to significant differences in stratum and program results.

01 BULBS NOT INSTALLED
STRATUM: MEDIUM

Situation: Bulbs bought in 2018, returned in 2019.
Energy realization rate: 0%
Impact on savings: Removing this project increases the energy realization rate for the medium stratum from 76% to 80%, increases the energy realization rate for the program from 74% to 75%, and tightens the precision for energy savings by 0.05%.

02 MISSING MEASURE TYPE
STRATUM: LARGE

Situation: Project listed as having purchased more than 1,000 bulbs, but on inspection only 23 were installed.
Energy realization rate: 2%
Impact on savings: Removing this site increases the realization rate for the large stratum from 60% to 63%, increases the realization rate for the program from 74% to 75%, and has little effect on the precision values.

03 RESIDENTIAL SITES
STRATUM: LARGE

Situation: Large apartment complex installed bulbs within individual residential units.
Energy realization rate: 19%
Impact on savings: Removing this project increases the energy realization rate for the large stratum from 60% to 62%, increases the realization rate for the program from 74% to 75%, and loosens the precision for energy savings by 0.05%.

04 OFF THE GRID
STRATUM: SMALL

Situation: Bulbs purchased by the New York Fire Department installed on a fire boat, which is not connected to the grid.
Energy realization rate: 0%
Impact on savings: While this very small site did not affect the program savings appreciably, it illustrates the type of situations that add uncertainty to ILIP that are not present in traditional downstream programs.

Final Sampling Precision

The evaluated energy savings did not meet the projected 10% precision due to lower participation in the program, and more overall variance in all three strata, illustrated by the final CVs.

Table 3-4: Predicted ILIP Precision

Population Stratum	Predicted Sample	Estimated CV	Estimated Relative Precision
Large	22	0.5	15.8%
Medium	22	0.5	17.3%
Small	22	0.5	18.3%
Overall	**66**		**10.0%**

Table 3-5: Achieved ILIP Precision

Population Stratum	Achieved Sample	Achieved CV	Achieved Relative Precision
Large	16	0.81	25.9%
Medium	23	0.92	29.8%
Small	33	0.78	22.6%
Overall	**72**		**11.5%**

Early in the evaluation, Navigant found that there were proportionally fewer projects in the Large stratum than anticipated based on the first months of the program. Navigant adjusted the sample size for that stratum down accordingly, increasing the number of Small and Medium projects. TRC visited and Navigant evaluated 16 of 33 Large projects.

Despite adding six projects to the original sampling plan, primarily in Medium and Large strata, the uncertainty in the program led to a lower precision than anticipated. This is due in large part to projects like the case studies noted on the previous page.

Outlier projects led to a higher CV and lower precision than predicted for ILIP, resulting in a precision of 11.5% for kWh despite an increased sample size.

Recommendations

- Impact Recommendations Summary
- Impact Recommendations

04

Based on Navigant's analysis of program savings and project findings, five key impact recommendations for the Con Ed team were identified within three major categories.

Program Communication

01. Clearly indicate to customers that they are participating in a Con Edison program.

02. Ensure that customers understand the rules of the program.

Program communication is important both for Con Edison visibility, and for program savings success.

Program Documentation

03. Clearly indicate in the documentation which bulbs have been returned.

Program documentation allows for both easier verification and greater accuracy.

Savings Parameters

04. Utilize a lower deemed HOU and CF for the program to avoid overestimating savings.

05. Consider utilizing an ISR of less than 100%.

Savings parameters recommendations are important for planning accuracy.

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Program communication is important both for Con Edison visibility, and for program savings success.

Communication

01. Clearly indicate to customers that they are participating in a Con Edison program.

02. Ensure that the rules of the program are provided clearly to the customers.

01 During the initial interaction with the distributors, customers should be more clearly informed of the existence of the ILIP, and that the discounted bulbs are a part of the ILIP. Without this awareness, it is difficult to schedule the site visits, and an inspector or evaluator is less likely to be granted access to the site.

02 The verification process indicated that there were some details and requirements of the program that customers were not aware of. Many customers kept spare boxes of program-discounted bulbs on site, but uninstalled, intending to use them as spares. This is in violation of program rules when the spares exclude 5% of total bulbs, and led to decreased verified savings for these sites. Additionally, several customers installed program-discounted bulbs within residential units of large, multifamily housing complexes. This also led to a decrease in verified savings.

Navigant recommends clearly identifying the customer and rules of the program during the initial customer contact with the distributor

Improved program documentation allows for both easier verification and greater accuracy of ex ante savings estimates.

Documentation

03. Clearly indicate in the documentation which bulbs have been returned.

03 For bulbs that are ultimately returned to the distributor, whether that is because the customer returns them, following the rules of the program, or the implementer does so following one of their on-site inspections, these bulbs should be clearly linked to the original purchase in the database. This will allow the evaluation team to more accurately estimate the ex post savings for that site, based on both the original purchase and the returned bulbs.

Clearly linking returned bulbs is particularly important when those bulbs are returned in a different program year than they were purchased. For the project detailed in section 3, the customer bought additional bulbs in 2019 after returning the initial purchase.

Navigant recommends clearly documenting returned bulbs so that they can be tied to their original entry in the tracking database.

Savings parameter recommendations are important for project verification and evaluation, increasing accuracy of ex ante savings estimates.

Savings Parameters

04. Utilize a lower deemed HOU and CF for the program to avoid overestimating savings.

05. Consider utilizing an ISR of less than 100%.

04 As originally outlined in Navigant's Database Review Memo, Navigant recommends utilizing a lower deemed value for Hours of Use for the ILIP savings calculations. Site verification found that the values currently in use overestimated savings, leading to a low realization rate. Utilizing a more conservative value would increase accuracy of savings estimates.

Based on evaluated projects, Navigant recommends an HOU value of 4,515 and a CF value of 0.91.

05 Most projects saw a less-than 100% installation rate for bulbs, whether that was due to burn out or keeping the bulbs as spares. This also contributed to a low realization rate. Adding an ISR of less than 100% into the savings calculations would provide a more conservative and accurate estimate of savings.

Across the program, weighted ISR was 87%. This is consistent with other midstream programs Navigant has evaluated.

Navigant recommends updates to the HOU, CF, and Installation rate numbers for future program rules based on the results of the 2018 evaluation.

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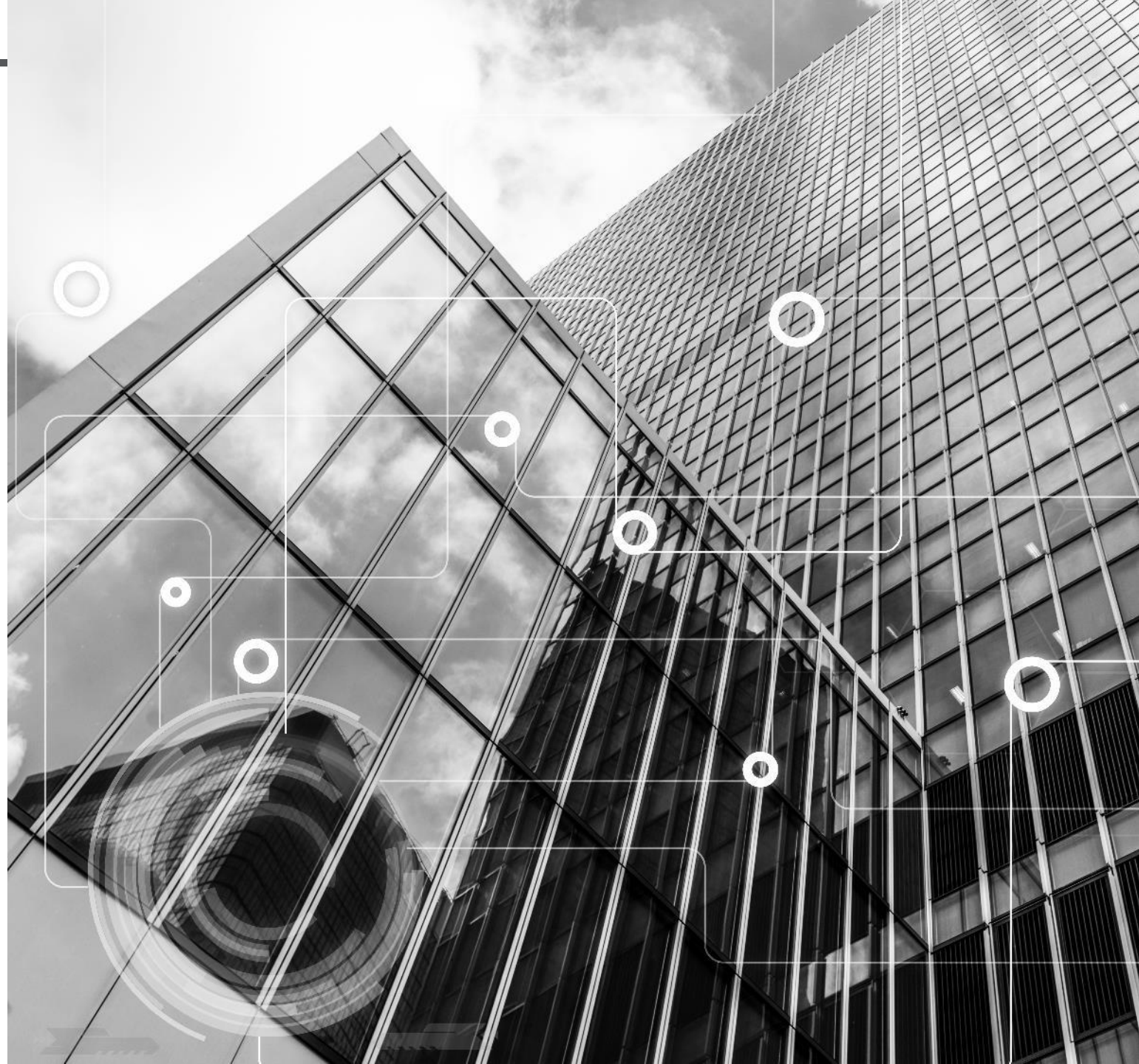

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