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**Exploring the Potential for Off Peak Delivery in Metropolitan Chicago:
Research Findings and Conclusions**

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TECHNICAL SUMMARY

Title

Exploring the Potential for Off Peak Delivery in Metropolitan Chicago: Research Findings and Conclusions

Introduction

Businesses generally want to receive deliveries during their normal work hours. Truckers need to schedule deliveries to meet those demands. As a result, most truck deliveries occur during the most congested daytime traffic periods.

If more businesses would accept deliveries in off peak times when there is less traffic congestion, trucks could deliver goods faster and at less cost. That would reduce congestion and cost of goods, and yield economic and environmental benefits.

This report summarizes our research over the past two years on possible strategies to shift more deliveries of goods to times when traffic is light – i.e., off-peak delivery (OPD) – as one way to lessen congestion in the Chicago area.

Approach and Methodology

The research included review of literature and case studies, data analysis, mapping, interviews and policy analysis.

Findings

Findings and conclusions are presented, including the potential benefits of OPD, how various OPD programs have been implemented, challenges to achieving more OPD, how market forces affect potential for OPD, and possible strategies to achieve more OPD.

Conclusions

1. OPD programs have been successfully implemented in several places around the world.

2. OPD can yield substantial benefits, but it can be challenging to implement.
3. The benefits and costs of OPD are not always evenly distributed.
4. Some OPD is happening now, but further efforts should be made to shift deliveries to off-peak times. There are several ways that more OPD can happen in Chicago.

Recommendations

Instead of this report serving as the basis for launching a pilot program now, it presents research and options as a foundation for future efforts by interested organizations to consider and adopt strategies and methods to shift more deliveries to off-peak times.

Publications

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Table of Contents

	Page #
Introduction and Executive Summary	7
Off-Peak Delivery can reduce traffic congestion, speed goods movement and improve communities and the environment.	9
Other Regions Have Tried OPD.	11
Real-world challenges limit the potential for shifting deliveries to off-peak times.	16
Unassisted off-peak delivery may have more potential for some types of businesses.	17
Consolidated delivery centers can facilitate OPD.	18
Truckers make some off-peak deliveries now and could do more if receivers were willing.	18
Incentives can help correct the mismatch between benefits and costs of an OPD program.	19
Regulations and public policies can affect OPD.	21
Chicago regulations are relatively neutral on off-peak delivery.	22
CDOT is interested in shifting more deliveries to off-peak times to lessen congestion.	22
Several actions, from voluntary to regulatory, could shift more deliveries to off-peak times.	23
Two areas were identified and analyzed for a possible OPD pilot program in Chicago.	25
There are several options for designing and implementing an OPD pilot program.	27
If it is determined to implement an OPD pilot program, plan and execute it carefully.	28

Conclusion	30
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	Page #
Appendix 1: Literature Review and Case Studies	31
Appendix 2: Identifying Business Participants and Optimum Locations	67
Appendix 3: Summary of CMAP Survey Responses on Regulation of Overnight Deliveries	75
Appendix 4: Excerpts from the 2008 Chicago Downtown Freight Study	76
Appendix 5: Draft Survey Questions to Carriers and Receivers	84
Footnotes	92
Bibliography	94

Introduction and Executive Summary

Businesses generally want to receive deliveries during their normal work hours. Truckers need to schedule deliveries to meet those demands. As a result, most truck deliveries occur during the most congested daytime traffic periods.

If more businesses would accept deliveries in off peak times when there is less traffic congestion, trucks could deliver goods faster and at less cost. That would reduce congestion and cost of goods, and yield economic and environmental benefits.

This report summarizes our research over the past two years on possible strategies to shift more deliveries of goods to times when traffic is light – i.e., off-peak delivery (OPD) – as one way to lessen congestion in the Chicago area. The research included review of literature and case studies, data analysis, mapping, interviews and policy analysis. Findings and conclusions are presented, including the potential benefits of OPD, how various OPD programs have been implemented, challenges to achieving more OPD, how market forces affect potential for OPD, and possible strategies to achieve more OPD.

Our primary business leadership collaborator has been the Supply Chain Innovation Network of Chicago (SINC). SINC is an organization of freight business CEOs launched in late 2013 by World Business Chicago to build the region's freight-related economy and make goods movement more efficient.

Funding for this research was provided by The National University Rail Center (NURail) and the Illinois Department of Transportation, for which the Urban Transportation Center is very grateful. We are also grateful to the many organizations that have contributed helpful data, advice and information, including SINC, Chicago Metropolitan Agency for Planning (CMAP), Chicago Department of Transportation (CDOT), Illinois Department of Transportation (IDOT), Mid-West Truckers Association, World Business Chicago, Chicago Loop Alliance, Chicago Central Area Committee, Northwestern Memorial Hospital, Northwestern Medical School, Lurie Children's Hospital, Rensselaer Polytechnic Institute, New York City Department of Transportation, Florida Department of Transportation, District of Columbia Department of Transportation, PierPass and others.

This project began with a shared desire by the Urban Transportation Center (UTC) research team and SINC to design and implement a pilot program to incentivize off-peak deliveries in the Chicago area. However, when results of the research were shared with stakeholders, the responses led to a different result. No source of funds for OPD incentives has been found. No business organization has been identified that is currently in a position to sponsor an OPD incentive program. Further, although several public agencies have supported the concept of shifting more deliveries to off-peak times, none has made it an immediate priority.

As a result, instead of this report serving as the basis for launching a pilot program now, it provides a foundation for future efforts by interested organizations to consider and adopt strategies and methods to shift more deliveries to off-peak times.

Findings and conclusions discussed in this report include:

- 1) OPD programs have been successfully implemented in several places around the world.
- 2) OPD can yield substantial benefits, but it can be challenging to implement.
- 3) The benefits and costs of OPD are not always evenly distributed. Carriers generally like the idea because it can save them time and money, but receiving businesses often resist it because it is inconvenient for them and can add costs. OPD offers broad public benefits from lessened congestion and improved air quality, but neighbors may have concerns about nighttime noise. An OPD program would need to be carefully designed to balance the benefits and costs to make it practical for carriers, receivers, shippers, customers and the community.
- 4) Some OPD is happening now, but better data is needed to understand its extent.
- 5) Further efforts should be made to shift deliveries to off-peak times. There are several ways that more OPD can happen in Chicago, including:
 - a) Launching a campaign to identify and publicly recognize businesses that are taking off-peak deliveries and encourage more to do it.
 - a) Offering businesses various incentives to shift receipt of deliveries to off-peak times.
 - b) Shippers and truckers (who can benefit from reduced costs of OPD) could offer favorable pricing to customers who shift receipt of deliveries to off-peak times.
 - c) Transportation demand management strategies such as congestion pricing, supported by technology, could be used to shift some traffic and reduce peak time congestion.
 - d) Regulatory measures could require certain types of businesses in congested areas to shift some deliveries to off-peak times.
 - e) As a possible first step, design and implement an off-peak delivery pilot program.

Case studies, maps, data analysis and sample surveys are included in the Appendix to support further OPD implementation efforts.

Off-Peak Delivery can reduce traffic congestion, speed goods movement and improve communities and the environment.

1. Traffic congestion costs everyone.

Traffic congestion and delay increases the cost of delivering goods. Congestion in metropolitan Chicago consistently ranks amongst the worst in the country. Congestion costs the region's economy approximately \$7.3 billion annually.ⁱ Trucks represent about 10% of the region's traffic and 67% of the region's total freight volume, which both contributes to and is impacted by area congestion.ⁱⁱ Of the \$2 trillion in goods carried by trucks in the region, about 29% is delivered locallyⁱⁱⁱ.

2. Traffic congestion slows goods movement and increases costs.

The impact of congestion is distributed throughout the supply chain in terms of slower goods movement and higher costs. Congestion data prepared by CMAP shows that on several corridors where truck volumes are over 10,000 per day, congestion during morning peak periods increases travel times by an average of 60%. Many regional arterials and collector streets are also severely congested. On many area highways, in order to assure on-time arrival during the peak period it requires doubling the scheduled travel time of free-flow conditions.^{iv}

3. Peak period deliveries are a challenge for communities.

As trucks wind their way through snarled traffic to deliver goods, their impact does not go unnoticed by communities and their residents. In the 2014 CMAP Municipal Survey, 70% (weighted by population) reported that delivery impacts during peak periods are a challenge for their community.^v They use various regulatory measures and fines to restrict truck movements and they invest in improvements to add capacity and maintain the roadways. But until now there has been little use of direct incentives to shift deliveries to off-peak periods in the Chicago area.

4. Off-peak delivery can yield significant benefits.

The off-peak delivery pilot program in New York City demonstrated how this form of traffic demand management can benefit a wide variety of stakeholders. Pedestrians and cyclists experience increased safety and an improved quality of life with less interference from deliveries; daytime non-freight travelers benefit from faster travel speeds; freight carriers see increased productivity; and receivers enjoy increased reliability.^{vi} Analysis of the pilot project suggests that implementing long-term OPD policies in Manhattan would lead to travel time savings to all highway users of 3 to 5 minutes per trip. Carriers switching to the off-hours would save about 48 minutes in travel time and between one and three hours in total service time for

each delivery tour.^{vii} In addition, there would be significant reductions in parking fines, which frequently exceed \$1,000 per truck per month.^{viii}

Studies estimate that if fully funded, the NYC program could switch an excess of 20% of daytime freight delivery traffic to the off-hours. Conducting off-hour deliveries is about 30% cheaper for carriers than delivering during regular hours. The total economic benefit is estimated at \$150 million to \$200 million per year in travel time savings and pollution reductions.^{ix}

5. Off-peak delivery can impact the entire supply chain.

In addition to the trucking industry, there is the potential for companies up and down the supply chain to benefit. It could increase efficiency and capacity of the rail freight system. Within the Chicago region, the six class one railroads generate approximately 15,000 truck trips to and from their customers each day.^x An additional 7,500 truck trips are made each day between rail intermodal facilities.^{xi} Improvements to the truck freight system could carry over to rail freight in particular.

Highlights of OPD Benefits

Overall economic benefits: A study of OPD in New York City showed that implementing various OPD policies would generate a total savings of between \$100 and \$200 million/year in travel time savings and pollution reduction.^{xii}

- Travel time savings to all highway users were estimated at approximately 3-5 minutes per trip.^{xiii}
- Off-Peak Delivery is estimated to be 30-40% cheaper for carriers than regular daytime deliveries.^{xiv} According to the New York City study, carriers that switch to off-hours would save about 48 minutes in travel time per delivery tour and 1 to 3 hours in total service time per delivery tour.^{xv}

Increased efficiency and reliability:

- OPD can increase vehicle utilization. Surveys of the New York City freight system show that 25% of truck trips are empty and only 20% of the truck capacity is utilized.^{xvi}
- At the conclusion of the New York City pilot project, the main reason cited by receivers for continuing with off-peak delivery was its increased reliability.

Safety: Reduced congestion during peak periods leads to increased safety for pedestrians, cyclists, and other vehicles.

Improved air and environmental quality: Reduced travel time leads to a corresponding reduction in environmental pollutants.

OPD Can Yield Significant Benefits to Carriers, Receivers, and Travelers

- Reduced peak time congestion
- Reduced costs
- Time savings
- Reduced parking fines
- Increased reliability
- Improved safety
- Economic benefits
- Less pollution

Other Regions Have Tried OPD.

A review of literature found a number of examples of off-peak delivery programs that have been tried or implemented. Case studies based on that research are presented in Appendix 1. Some of them are highlighted below.

Other Regions Have Tried OPD

New York	<ul style="list-style-type: none">Initially a pilot project with 35 receivers, the long-term program now has more than 400 participants.
PierPass, Ports of Long Beach and Los Angeles	<ul style="list-style-type: none">PierPass began Off Peak in 2005 and by 2008 shifted 45% of container cargo to off peak shifts; still reporting more than 30% shift from peak to off peak.
Barcelona	<ul style="list-style-type: none">Began in 2003 with two grocery stores receiving off peak deliveries, by 2010 spread to over 400 stores in 35 provinces.
London	<ul style="list-style-type: none">Implemented off peak deliveries during the 2012 Olympics and currently conducting OPD trials in addition to cordon pricing in central London.

Dublin	<ul style="list-style-type: none">Cordon pricing in addition to limitations on heavy goods vehicles from 7am to 7pm. In 2011, approximately 25% of all food deliveries occurred during off-peak hours.
The Netherlands	<ul style="list-style-type: none">Fostered innovations in low-noise technologies and behaviors resulting in standards now used in over 50 cities with 1,400 quiet deliveries a week.
Orlando Pilot	<ul style="list-style-type: none">Hospital system Orlando Health is currently piloting OPD on their main campus in "South of Downtown Orlando."
Washington D.C. Pilot	<ul style="list-style-type: none">OPD was listed as a strategy to improve the movement and delivery of goods in the District's 2014 freight plan and is now being implemented through a pilot project.

New York City – Rensselaer Polytechnic Pilot



- Pilot project involved 35 receivers and 20 trucks/vendors.
- Half of participants did staffed OPD and half did unassisted OPD (store provided driver with a key or passcode).
- Receivers were given a \$2,000 incentive to participate; carriers got \$300 per truck.
- After the pilot all receivers doing staffed OPD reverted back to regular daytime deliveries, but almost all receivers doing unassisted OPD remained in the off-hours because of its reliability.

Results:

- Off-hour deliveries cost carriers about 30% less -- carriers save about 48 minutes in travel time and 1 to 3 hours in total service time for each delivery tour.
- Parking fines, often exceeding \$1,000 per truck per month, are reduced.
- OPD policies in Manhattan could save all highway users 3-5 minutes per trip.
- Long term OPD policies would save between \$100 and \$200 million/year in travel time and pollution reduction.
- Reduced peak time congestion makes it safer for pedestrians, cyclists and vehicles.
- Reduced travel time leads to a reduction in environmental pollutants.

More than 400 companies are participating in the permanent Off Hours Delivery program.

Find out more at <http://www.nyc.gov/html/dot/html/motorist/offhoursdelivery.shtml>

PierPass OffPeak – Ports of LA and Long Beach



- Los Angeles and Long Beach terminal operators launched PierPass OffPeak July 23, 2005.
- OffPeak uses pricing to reduce congestion and delay at the ports.
- International terminals established five OffPeak shifts per week:
 - 6:00 p.m. to 3:00 a.m. Monday through Thursday
 - 8:00 a.m. to 5:00 p.m. on Saturday
- No fee for containers entering or exiting the terminals during off-peak hours.
- Containers entering or exiting by road during peak hours (3:00 a.m. to 6:00 p.m. Monday to Friday) are charged a Traffic Mitigation Fee.
- By 2008, 45% of container cargo traffic shifted to off peak; still reporting more than 30% shifted.
- By 2014, OffPeak had diverted more than 30 million total truck trips from peak to off-peak times.
- More information can be found at <http://www.pierpass.org/>

Barcelona – Mercadona Supermarket Silent Nighttime Unloading Program



- Pilot project began in 2003 at two Mercadona supermarket locations. Deliveries took place from 11pm-midnight and 5am-6am. Large 40 ton trucks replaced small delivery vans.
- The pilot sought to determine:
 - a) The feasibility of silent night deliveries
 - b) The return on investment for vehicle adaptations and night shifts
- Noise reducing measures included carpeted flooring in the truck, low noise lifting system, carriers with low-noise rubber wheels, and staff training to minimize verbal communication and other noises.

Results

- Noise level during loading and unloading complied with regulations and differed very little from ambient conditions. No noise complaints from nearby residents.
- The pilot led Mercadona supermarkets to set up two night-time deliveries using large 40 ton trucks instead of seven peak-hour deliveries using vans.
- Mercadona estimated that full investment in vehicle adaptation is recoverable within three years.
- Following success of the pilot, Mercadona implemented a nationwide Silent Nighttime Unloading Program. By 2010, it had expanded to 407 stores in 35 provinces. They estimate that in 2010 their vehicles spent up to 80 percent less time in city centers, reducing congestion and noise and eliminating 70,000 tons of CO2 emissions.

Real-world challenges limit the potential for shifting deliveries to off-peak times.

1. There is a mismatch between benefits and costs.

Many of the benefits of off-peak delivery, such as reduced congestion, improved air quality and safety would accrue to the greater community, not just the carriers or receiving businesses. For example, in the New York pilot it was estimated that 90% of the congestion reduction benefit was region-wide, not just in the pilot project area.^{xvii} Increased night time noise may be a concern for residents but can be mitigated with low-noise strategies and equipment, driver training, and enforcement.

Businesses have not generally perceived that the benefit of taking deliveries in off hours would exceed the costs. Businesses might not directly see the increased costs of peak period deliveries because those costs are often spread throughout the market. Or, they may have calculated that receiving goods in off hours would cost more in staff time and security measures than they might save from reduced delivery charges. Or, they might not have thought about it at all.

2. Businesses generally want to receive deliveries when they are open.

As noted earlier, most businesses receive deliveries during the daytime. Receivers create freight demand and specify delivery times. They are the customers of the freight system and greatly influence how the supply chain operates. Truckers have reported that even higher tolls during peak times won't make them shift trips to off-peak times because they have to meet delivery requirements of their customers. A study of variable tolling in New York concluded the higher tolls had little impact on daytime delivery traffic because carriers needed to meet the demands of the receiving businesses which wanted deliveries when they were open for business.^{xviii} Similarly, a majority of truckers responding to a recent Illinois Tollway survey said that they could not generally travel during off-peak times because of the need to meet required pick-up and delivery times of shippers and receivers.^{xix}

3. Location and industry type can affect participation.

Receiving businesses and carriers may be more or less likely to participate in OPD based on their geographic location and industry type, which affect such things as delivery cost and the number of delivery stops made.^{xx}

- Businesses that are most receptive to off-peak deliveries are those that would likely be open during off-peak hours anyway, such as restaurants, bars, hotels, convenience stores, 24-hour supermarkets, big-box retailers and medical facilities.

- Carriers have a financial incentive to participate in OPD, but this incentive is diminished if only a few of their receivers are interested in OPD and the carrier must make two separate trips (one in the day and one at night).
- Larger establishments (more than 250 employees) and buildings with many businesses yield the greatest savings in terms of the number of truck trips and cost effective implementation, as additional costs can be shared among more customers.

Unassisted off-peak delivery may have more potential for some types of businesses.

One type of off-peak delivery involves providing a setting for unassisted drop-offs. This requires some investment in physical improvements to create a secure area, but less ongoing staff expense.

- Unassisted deliveries have a greater potential for long term success. After the New York pilot concluded, almost all of the receivers doing unassisted OPD remained in the off-hours because of its reliability, without any additional incentives.^{xxi} However, when the pilot ended all of the receivers doing staffed OPD reverted back to regular daytime deliveries even though they were satisfied with their experience in the pilot.
- With unassisted OPD, liability issues decrease when receivers provide the driver with keys for the first set of double doors or install a virtual cage, which restricts drivers to an area marked off by sensors.^{xxii}
- The more deliveries an establishment receives, the less likely they are to participate in unassisted off-peak deliveries.

Unassisted off peak delivery may have more potential for some types of businesses.

- It involves providing a setting for unassisted drop-offs.
- It may require some investment to create a secure area – options include:
 - Delivery lockers
 - Double doors
 - Electronic key boxes
 - Virtual cages with deliveries entered through a hand-held scanner
- Less ongoing staff expense can enhance long term success.



Consolidated delivery centers can facilitate OPD.

Consolidated delivery centers are facilities at which goods from multiple sources can be delivered, sorted, and consolidated to allow fewer deliveries to the final destination. Consolidation can allow more flexibility of delivery times to the center or to the final destination, allowing more trips to occur during off hours. This model has been used with success at the Atlanta Olympics and in pilot projects in Germany and the UK. During a pilot project in Bristol, UK, consolidated deliveries resulted in a 73% reduction in delivery movements and a 65% reduction in vehicle mileage.^{xxiii} In those places, multiple businesses took advantage of the consolidated delivery center to share freight services. However, consolidated delivery centers can also be of use to a single large building or campus in a congested area. For example, Orlando Health uses a consolidated delivery center offsite of their campus, which is located in a congested area south of downtown Orlando. Deliveries arrive at the less congested consolidated delivery center and are sorted and consolidated for delivery to the main campus during off hours. Other examples of consolidated delivery include:

- "The Green Link" in Paris offers urban service delivery. The Green Link is responsible for taking charge of last mile deliveries for carriers such as FedEx. The company has a network of urban freight terminals located in dense Paris neighborhoods called "Green Hubs". The goods are unloaded and loaded into electric vehicles and on cargo-bikes. An information system provides real-time management.
- The London Boroughs Consolidation Centre (LBCC) is a facility that channels suppliers' deliveries into one central point. The goods are then sorted onto fewer vehicles for the last mile of the journey to final delivery sites, on a just in time basis. Initially four suppliers delivered to the LBCC, but over time the number has increased to 72.

Truckers make some off-peak deliveries now and could do more if receivers were willing.

To better understand the needs and preferences of trucking firms and aid in designing the pilot program, a survey was drafted that the Mid-West Truckers Association distributed to its members. Although the number of responses was small, several findings from the initial responses are worth noting:

- About 25% of the respondents already make deliveries in the off hours of 7pm to 6am; they all make deliveries from 6am-10am; more than half also make deliveries from 10am to 3pm; fewer than 10% make deliveries from 3pm to 7pm.
- Nearly 75% of respondents said that if receivers were willing, it would be easy or somewhat easy to make deliveries during off-peak hours. (Those that indicated

implementing OPD would be difficult cited problems such as freight that needs constant refrigeration, shipper's hours, and logistics for loading the next delivery.)

- Respondents agreed that making deliveries during off-peak hours would be less expensive – perhaps as much as 30-40% cheaper than delivering during the day. However, only 18% indicated they would give a discount as high as 10% to deliver in the off-peak hours.
- Nearly 75% of respondents indicated that they might be interested in participating in an off-peak delivery pilot project.

These responses suggest that while truckers could be interested in doing more off-peak deliveries, and off-peak deliveries would reduce their costs by as much as 30-40%, few would be interested in offering a discount to businesses that would shift deliveries to off hours.

One possible interpretation of this is that the cost savings need to be proven before truckers would actually offer a discount for off-peak deliveries. Another interpretation is that truckers guess that the competitive market would lead their shipping or receiving customers to expect lower prices for off-peak deliveries, leaving the truckers no better off financially.

We need to better understand how the shipper, carrier and receiver relate to one another. The carrier is, to a degree, squeezed between the shipper and receiver. The carrier is generally chosen by the shipper to gain the best overall value in terms of reliability and cost. And the receiver has chosen to do business with the shipper for similar reasons in addition to an overall assessment of quality. So while the receiver dictates when the delivery should be made, the cost of delivery is just one of several factors considered.

Incentives can help correct the mismatch between benefits and costs of an OPD program.

Researchers in the New York program concluded that because receivers may be satisfied with the status quo, incentives are necessary to persuade them to participate in OPD. This can include a combination of one-time financial incentives, public recognition for outstanding service, or discounts from vendors for accepting OPD.^{xxiv}

In some cases, however, financial incentives may not be needed. For example, in Barcelona the one chain supermarket that tested OPD has since expanded its use to over 100 of its store locations throughout Spain, without any incentives.^{xxv} Orlando Health, the major health system in Orlando is implementing OPD with no other incentive than to improve congestion and foot traffic around their facilities.

In New York, participants in the pilot project received a one-time financial incentive. Receivers were given \$2,000 and carriers were given \$300 per participating truck. Receivers could use the incentive to pay nighttime staff to accept the deliveries or for equipment to accept unassisted deliveries. About half of the receivers used their staff to accept OPD, so paying the additional staff used up most of the incentive. The other half allowed the vendors to have access to their establishment to deposit the OPD, so their staff did not need to be present and the incentive became a net profit.^{xxvi}

Subsequent research found that a \$10,000/year incentive to receivers would maximize the program's net benefits. At that amount, the combined economic benefit for carriers and road users exceeds the total incentive cost to receivers and maximizes the net benefit. As the incentive grows, the net benefit declines as the costs increase at an accelerating pace due to the increasing incentive amount and the increasing number of establishments that take the incentive. Beyond an incentive of \$15,000/year to receivers, the total costs outweigh the benefits of OPD. The study also found that increasing OPD at large traffic generators has the potential to produce comparable economic benefits for a \$5,000 incentive to individual establishment receivers, at only a small fraction of the cost.^{xxvii}

In the ports of Los Angeles and Long Beach, the PierPass OffPeak program offers an incentive for cargo moved during off-peak shifts. PierPass is a not-for-profit company created by marine terminal operators at the ports of Los Angeles and Long Beach, California to address multi-terminal issues such as congestion, security, and air quality. The company created a market-based incentive program called OffPeak. The program provides an incentive for cargo owners to move cargo at night and on weekends (off-peak shifts) to reduce truck traffic and pollution during peak daytime hours and to alleviate port congestion. PierPass is the only permanent off-peak program in the United States.

Beginning July 23, 2005, all international container terminals at the Los Angeles and Long Beach ports established five OffPeak shifts per week on nights and weekends. Containers entering or exiting the terminals by road during peak hours (3:00 a.m. to 6:00 p.m. Monday through Friday) are charged a Traffic Mitigation Fee. No fee is charged for containers entering or exiting the terminals during off-peak hours.

Since 2005, the Traffic Mitigation Fee (TMF) has been assessed on all loaded containers entering or exiting marine terminal gates by road during peak daytime hours. The initial fee was \$40 per TEU (20-foot equivalent unit), or \$80 for all containers larger than 20 feet. By 2014 the fee had increased to \$66.50 per twenty-foot container, or \$133 per forty foot container. The fee is adjusted annually to reflect increases in labor costs based on maritime labor cost

figures.^{xxviii} There is no fee assessed for empty containers and chassis, domestic containers, or transshipment to other ports or on all traffic that is handled through the marine terminal gates during off-peak hours. Nor is there a fee for intermodal containers that depart or arrive via the Alameda Corridor for import or export, or that pay an ACTA (Alameda Corridor Transit Authority) fee. The beneficial cargo owners (shippers, consignees, or their agents) are responsible for the fee payment. The trucking community and water carriers are not responsible for the payment.

The TMF payments, minus PierPass expenses, are allocated by PierPass to the marine terminals to help offset their incremental costs to operate the extra shifts. The estimated annual cost to the terminal operators of operating the extra shifts is \$156 million to \$160 million.

The results of the OffPeak program have been impressive. The initial goal was to shift 15-20% of all cargo movement to OffPeak within the first year and 30-35% within two years, but after just 10 weeks PierPass reported that they had exceeded their goal for the year. In October 2005, PierPass reported that the program had shifted 30-35% of container cargo at all ports to OffPeak shifts on a typical day; by July 2008 that grew to 45%.^{xxix}

While the Chicago freight system's complex multi-corridor layout could make it difficult to duplicate PierPass OffPeak here, it is worth understanding the idea and considering how time of day pricing could produce similar benefits.

Washington D.C. is recruiting businesses to participate in an OPD pilot program and will offer a sliding scale of incentives that may range from a large one-time incentive to pay for facility or equipment changes to enable unassisted overnight deliveries to smaller incentives for night-time staff to receive deliveries.

Regulations and public policies can affect OPD.

Public policies and regulations can be significant in incentivizing, or inducing, businesses to participate in an OPD program. Studies and experience in California and New York concluded that active support from government is needed to achieve long-term implementation of off-peak delivery. The Urban Freeway Gridlock Study that examined alternatives to reduce congestion in California's freeway system concluded that implementation of off-peak delivery would depend on governments requiring shippers and receivers to change their delivery and operating schemes.^{xxx} Ultimately, it was the threat of action by the California legislature that led terminal operators to organize and implement the PierPass OffPeak program. New York researchers also concluded that cooperation and support from the City would be important to achieve a successful OPD program.

In the Chicago metropolitan area, regulations and restrictions that impact OPD vary by municipality. They can range from prohibitions on overnight deliveries to limitations on idling, noise, or exhaust. There is no centralized database of these restrictions in metropolitan Chicago. However, the Chicago Metropolitan Agency for Planning conducted a municipal survey in 2014 which revealed that 46% of respondents – 70% when weighted by population – find delivery impacts during peak periods “somewhat of a challenge” or “more of a challenge.” Likewise, inadequate on-street loading zones were “somewhat” or “more of a challenge” for 49% of respondents.

Chicago regulations are relatively neutral on off-peak delivery.

Within Chicago, there is no ordinance generally restricting overnight delivery, but there are time of day regulations for individual parcels that have been established through the land development process. For example, an alderman required Northwestern Memorial Hospital and their associated facilities to submit monthly reports to the alderman’s office that detail “unscheduled” daytime deliveries (mostly by UPS and FedEx); they continue to submit those reports. One might surmise that the alderman who requested those reports was interested in limiting daytime deliveries.

In the Municipal Code of Chicago, the Chicago Zoning Ordinance (Title 17) and the Chicago Traffic Code (Title 9) contain most of the pertinent rules and regulations that impact freight movements. The Zoning Ordinance addresses zoning for parking and loading; it defines the quantity and design standards for required freight facilities for new developments. The Department of Planning and Development and Department of Transportation review site plans for new developments to ensure proper design.

In Title 9, the Chicago Traffic Code, Chapter 64 addresses parking regulations, Chapter 68 addresses restricted parking, and Chapter 72 addresses vehicle size and weight limits. While there are certain restrictions on truck access to the central business district area, trucks making deliveries within the central business district are exempt from these provisions. The *Traffic Code* includes regulations that limit truck movements, lists fines for illegal activities, and regulates loading zone placement and use. The *Traffic Code* is enforced by the Chicago Police Department and the Office of Emergency Management and Communications (OEMC).

CDOT is interested in shifting more deliveries to off-peak times to lessen congestion.

The City of Chicago has focused much attention on reducing congestion and improving traffic circulation in the downtown area. Officials at the Chicago Department of Transportation have

shown interest in having more businesses accept deliveries in off-peak times. The 2008 Chicago Downtown Freight Study included the following among its more than 60 recommendations:

*“Encourage off-peak deliveries:
Freight deliveries can operate more efficiently if there is dock access during off-peak (non-business) hours, thereby spreading the number of delivery vehicles and their competition for limited loading facilities over a longer period of time. However, building managers are reluctant to allow access to docks during non-business hours due to potential additional operating costs and/or security issues. Currently, New York City is exploring the provision of tax subsidies for additional employees to staff loading facilities during offpeak hours, a concept that may be applicable to Chicago. The City can work with BOMA to identify other potential incentives.”^{xxxix}*

The same 2008 study said “Encourage off-peak deliveries” could be a potential short-term initiative that could reduce illegal parking and reduce peak hour traffic with no interruption of deliveries. It noted the challenge of getting building manager buy-in, and that extra costs to buildings may require incentives. It also noted the need to involve the Building Owners and Managers Association in addition to trucking firms and CDOT. Other recommendations included various fees and fines in peak periods that could further encourage shifting some deliveries to off-peak times.^{xxxii} A summary of the recommendations in the 2008 study is included in Appendix 4.

Several actions, from voluntary to regulatory, could shift more deliveries to off-peak times.

Actions that might be taken to achieve more OPD range from convening and encouraging voluntary action to adopting new ordinances and regulations.

A. Voluntary action – some initial options

A simple but worthwhile step would be for SINC and/or CDOT to meet with members of the Midwest Truckers Association and Illinois Trucking Association to discuss results of the truckers survey, gain more input, explore opportunities to achieve more off-peak deliveries, and develop an action agenda.

The City (including Mayor’s office, CDOT, aldermen) could convene a meeting of businesses, perhaps in cooperation with SINC, Chicago Loop Alliance, Building Owners and Managers Association (BOMA) and/or World Business Chicago to explore options for shifting more deliveries to off-peak times. Through such a process, an action agenda could be developed to lessen congestion while supporting vital economic activity in the Loop. Similar efforts in other

congested areas could be undertaken. A survey of businesses could be included in this process to better understand business needs and practices, and see how more OPD might be done.

The City, again in cooperation with SINC and others, could invite representatives of UPS and FedEx, and perhaps Amazon, to discuss the extent to which deliveries could be made at times when there is less impact on traffic congestion. It might be possible for such companies to structure delivery routes and offer pricing incentives for customers who accept deliveries at off-peak times. The Northwestern Medical Center area is one of many areas that could benefit from such action. This effort could be especially timely given the steady trend toward more on-line purchasing and direct delivery.

With active engagement of organizations like UI Labs – City Digital and technology companies, strategies and methods could be developed and piloted to more effectively utilize street space and enable more efficient use of loading zones that are already regulated by ordinance. City Digital is a collaboration of business, government, university and civic leaders seeking to best apply technology to address urban challenges, including transportation.

B. Regulatory action

Regulatory action may be in order if the City is really motivated to shift more deliveries to off-peak times. It would be important to make best use of technology, as mentioned above, to support sound regulations. Elements that could be included in an ordinance aimed at requiring more off-peak delivery in Chicago include, for example, the following:

Suggested Goal: 50% of deliveries received by certain types of businesses will be made in off-peak times in designated areas of the city. Businesses affected would include restaurants, bars, grocery stores, hotels, hospitals and others with hours extending beyond identified peak hours.

Suggested Ordinance provisions:

- Define peak and off-peak times in designated areas of the City.
- Define designated areas covered by this ordinance.
- Define types of businesses covered by this ordinance in the designated areas.
- Designate additional parking areas and loading zones available for deliveries during off-peak times.
- Create a special commercial vehicle parking permit authorizing use of designated parking areas during off-peak times.
- Increase fines for parking violations during peak periods in designated areas.
- Require businesses covered by this ordinance in designated areas of the City to regularly submit reports to CDOT stating: time of day and number of deliveries received; and additional costs incurred, if any, for handling off-peak deliveries.

- Assess a fee to businesses covered by this ordinance for each month that less than 50% of deliveries occur in off-peak times.
- The ordinance could be designed as a pilot project in effect for a limited time, perhaps three years, to ensure that results are evaluated and modifications made before renewal.

For local policies and regulations to be most effective, they should be supported by consistent regional and state policies. This could include such measures as congestion pricing on major roadways and parking regulations and fees that vary by time of day. A number of policy and regulatory options were suggested in the Chicago Downtown Freight Study; some pertinent excerpts are included in Appendix 4.

Two areas were identified and analyzed for a possible OPD pilot program in Chicago.

Appendix 2 contains maps reflecting an analysis of locations of the types of businesses most likely to participate in an OPD program – businesses in the retail trade, health care, accommodations and food services industries that have more than 100 employees. Also included in Appendix 2 are CMAP maps of traffic delay and travel time reliability, and a UTC analysis of locations of truck parking citations and truck citation density.

Analysis of those maps and data resulted in identification of several locations where businesses most likely to participate in OPD are densely located and where an OPD program could substantially reduce peak period traffic volume. Subsequently, the Chicago downtown “Loop” and the Northwestern Memorial Hospital area east of North Michigan Avenue were identified for consideration of a possible OPD pilot. Preliminary analysis of those areas indicates that some OPD is already happening, and there are both opportunities and challenges for implementing OPD.

A. Chicago downtown “Loop”

The density of business activity coupled with chronic traffic congestion make the downtown area a natural target for OPD. The 2008 CDOT downtown freight study recommended that off-peak delivery be considered for this area. The research team and SINC introduced OPD to businesses at a downtown seminar in June 2015. The idea of doing an OPD pilot project was discussed with several downtown organizations that have been supportive of the concept of off-peak delivery including the Chicago Loop Alliance, Chicago Central Area Committee and World Business Chicago. While there was general support from business organizations for the idea of OPD, practical concerns arose including:

- Concern that OPD might add costs to businesses.

- Doubts about whether enough businesses would do OPD voluntarily if it wasn't required.
- Concern that aldermen might object if there were any complaints from residents about possible negative impacts such as noise.
- Concern that businesses association members might react negatively if their association was seen as actively supporting a program that might add costs.

A survey of downtown businesses was drafted as a step to gauge business interest in OPD and aid in designing the program to work best. However, no business organization was in a position to assist in surveying its members (possibly due to concerns noted above). In addition, UTC did not have sufficient resources allocated to do the survey on its own. The draft survey can be found in Appendix 5.

Analysis of any OPD program is made more difficult because there is no existing database on when businesses take deliveries. However, it is certain that some off-peak deliveries happen now; truckers surveyed reported a quarter of their deliveries are in off-peak hours (as noted on page 18). Some businesses in the Loop, such as Target, take deliveries after hours. More data is needed, and a survey of businesses would be a good start.

B. Northwestern Memorial Hospital area east of North Michigan Avenue

The Northwestern Hospital area is characterized by dense business development, tight street layouts and heavy daytime traffic. As a practical response to this, progress has already been made on OPD in the Northwestern Hospital area. Logistics directors at Northwestern Memorial Hospital, Lurie Children's Hospital and Northwestern Medical School indicated that as much as two thirds of their deliveries are currently received at night; these are primarily bulk items such as linens, paper goods and food supplies.

There has been interest among the logistics directors in shifting more of the unscheduled daytime deliveries to off-peak times, but it is more complicated to accomplish because of the number and variety of businesses involved. Unscheduled daytime deliveries are made to medical offices and facilities, mostly by UPS and FedEx. Daytime deliveries are also made to the many retail and food businesses that operate through leases with Northwestern's real estate division. Those deliveries are neither tracked nor coordinated by hospital logistics staff.

One potential way to enable implementation of off peak delivery by the many smaller businesses throughout the Northwestern hospital area could be to establish a consolidated delivery station (discussed on page 18) on or near the hospital campus. This delivery station could be designed with security features to allow secure unstaffed deliveries throughout the

day or night. Deliveries could then be sorted and transported throughout the campus in a coordinated fashion.

The consolidated delivery concept need not be limited to the hospital campus alone but could potentially include nearby businesses. This idea merits further study. It is not a simple thing to set up, and should only be done if it can be reliable, cost-effective, improve delivery speed and reduce peak period street traffic.

There are several options for designing and implementing an OPD pilot program.

If it is determined to undertake a pilot OPD program, there are four general models for designing it.

1. New York City Approach –

Using grant funding as a financial incentive as in the New York pilot, seek out receivers in a particular corridor or area to implement off peak delivery on a trial basis.

2. One Large Receiver Approach –

Identify one large receiver to be a demonstration project. A major healthcare facility would have ideal scale and volume. This may or may not require a financial incentive; none was needed in Orlando.

3. Package Approach –

Piece together an attractive package of discounts and non-monetary incentives, such as:

- Financial incentives
- Public recognition through a coordinated program
- Direct discounts by carriers to receivers for off peak deliveries
- Coordinated participation by receiving businesses
- Discounted fees and charges from governments and supportive businesses.
- One-time funding for physical improvements such as storage lockers for unstaffed OPD or sound-reducing technologies (if funds are available).
- List of “Trusted Vendors” that certify certain safe and quiet delivery practices

4. Regulatory Approach – a local ordinance (as suggested on page 24) would create temporary regulations for a pilot project. London and Copenhagen have adopted regulations that are more permanent in nature.

Any of these approaches would need coordinated administration and publicity with an official website and marketing material.

The New York City pilot, with extensive research assistance by Renesselaer Polytechnic Institute, led to a permanent off-peak program. It focuses on unassisted OPD (see page 17) in retail and food sectors, including use of virtual cages, noise absorbing materials and low noise trucks, platforms and carts. Along with technology, a noise policy is being developed to ensure deliveries are quiet and not disruptive to local residents. The first layer of the policy includes commitment involving a code of conduct for both receivers and carriers to ensure health and safety and commitment to the community. The second layer includes training for driver behavior and low noise equipment. The final layer of the policy is enforcement by NYCDOT and NYCEPA to investigate violations and enforce compliance.^{xxxiii}

The permanent New York City program includes more than 400 participating businesses. In 2013, the USDOT, NYCDOT, and the Renesselaer Polytechnic Institute invited interested business owners to sign up for “NYC delieverEASE.” A \$2,000 financial incentive is offered to receivers. Participants include Sysco, Duane Reade, Dunkin Donuts, Beverage Works, and Waldorf Astoria. In total, 4% of the establishments in the accommodation and food sector in Manhattan are represented.^{xxxiv} To date, no noise complaints have been received.

If it is determined to implement an OPD pilot program, plan it carefully.

A. Create a leadership committee.

A leadership committee should be created with assigned responsibility and accountability. The committee should include interested and supportive business organizations, trucking firms, SINC, CMAP, CDOT, IDOT and other relevant organizations like Midwest Truckers, UI Labs-City Digital and World Business Chicago. Adequate staff should be assigned to plan and execute the program.

B. Learn and understand the needs and interests of carriers and receiving businesses.

Meet with key trucking firms such as UPS and FedEx. Seek involvement from trucking organizations such as Midwest Truckers and Illinois Trucking Association. Meet with business organizations such as the Chicago Loop Alliance and BOMA. Conduct surveys of businesses and carriers as needed.

Appendix 5 includes two draft surveys to gauge interest among businesses and carriers in participating in an OPD program, and to better understand their needs and delivery arrangements. As previously noted, the survey of businesses has not occurred, and the Midwest Truckers Association distributed a survey of truckers to its members and received some initial responses. It is important to understand the needs and operations of businesses and trucking firms in order to act most effectively to shift more deliveries to off-peak times.

C. Design the program for success. This will involve several types of decisions.

- 1) Determine type of OPD for each business and how to cover related costs, if any:

- a) Some businesses might have operating hours that would enable them to handle OPD without adding staff.
 - b) Some businesses might require staff to be present to handle off hours deliveries and those costs would need to be covered somehow.
 - c) Some businesses might be able to handle off hours deliveries without staff being present, but that might require investing in secure facilities and technology.
- 2) Identify the elements needed to gain participation by receivers or carriers – for example:
 - a) Recognition
 - b) Technology
 - c) Direct discounts from carriers
 - d) Subsidies
 - e) Local regulations
 - 3) Identify government actions that might help make OPD successful – for example:
 - a) Additional parking or cheaper parking for off hours deliveries
 - b) Easier access for deliveries during off hours
 - c) Access restrictions during peak periods
 - d) Tax credit or abatement
 - e) Other local regulations
 - 4) Determine administrative requirements and costs for the program.
 - a) Work plan and budget
 - b) Assignment of responsibilities
 - 5) Establish a practical plan to pay for the program – sources might include, for example:
 - a) Carriers – discounts to participating businesses, cover some project costs
 - b) Federal or State grants – e.g., USDOT, IDOT
 - c) Local funds – e.g., TIF districts, peak period parking fees or area access fees
 - d) Foundations
 - e) Sponsorships
 - 6) Determine program evaluation methods, set baseline data and appropriate measures of the project’s results, and optimize scalability for the full program.
 - 7) Arrange publicity and communication including possible creation of an advisory group.

All of these decisions should be made with involvement of stakeholders and likely participants. Once these decisions have been made and a viable financial plan is in place, willing and suitable participants for the pilot would need to be engaged.

Conclusion

Although this project began with a desire to design and implement an off-peak delivery pilot program, the research and stakeholder responses led to a different result. So far, no source of adequate funds for OPD incentives has been found. No business organization has been identified that is currently in a position to sponsor an OPD incentive program. Further, although several public agencies have supported the concept of shifting more deliveries to off-peak times, none has made it an immediate priority.

Therefore, instead of this report serving as the basis for launching a pilot program now, it provides a foundation for future OPD efforts.

Findings and conclusions discussed in this report include:

- 1) OPD programs have been successfully implemented in several places around the world.
- 2) OPD can yield substantial benefits, but it can be challenging to implement.
- 3) The benefits and costs of OPD are not always evenly distributed. Carriers generally like the idea because it can save them time and money, but receiving businesses often resist it because it is inconvenient for them and can add costs. OPD offers broad public benefits from lessened congestion and improved air quality, but neighbors may have concerns about nighttime noise. An OPD program would need to be carefully designed to balance the benefits and costs to make it practical for carriers, receivers, shippers, customers and the community.
- 4) Some OPD is happening now, but better data is needed to understand its extent.
- 5) Further efforts should be made to shift deliveries to off-peak times. There are several ways that more OPD could happen in Chicago, including:
 - a) Launch a campaign to identify and publicly recognize businesses that are taking off-peak deliveries and encourage more to do it.
 - b) Offer businesses various incentives to shift receipt of deliveries to off-peak times.
 - c) Shippers and truckers (who can benefit from reduced costs of OPD) could offer favorable pricing to customers who shift receipt of deliveries to off-peak times.
 - d) Adopt transportation demand management strategies such as congestion pricing, supported by technology, to shift some traffic and reduce peak time congestion.
 - e) Consider regulatory measures to require certain types of businesses in congested areas to shift some deliveries to off-peak times.
 - f) As a first step, design and implement an off-peak delivery pilot program.

It is hoped that this research will be useful to others who wish to further consider and adopt practical and effective strategies to shift more deliveries to off-peak times.