# The Commercial Law Development Program
## *Presents*
## *Public-Private Partnership Webinar Series*

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# Life Cycle Cost Analysis
# In
# Public-Private Partnerships



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# Today’s presenter

**Bob Kwartin**
Green Powered Technology, LLC

# Today's Agenda

- Introduction to Life Cycle Cost Analysis (LCCA)
- Explore LCCA in Public-Private Partnerships (PPPs)

In this program you should expect to learn **about** LCCA,
but you will also learn how to **do** LCCA

# Assumptions

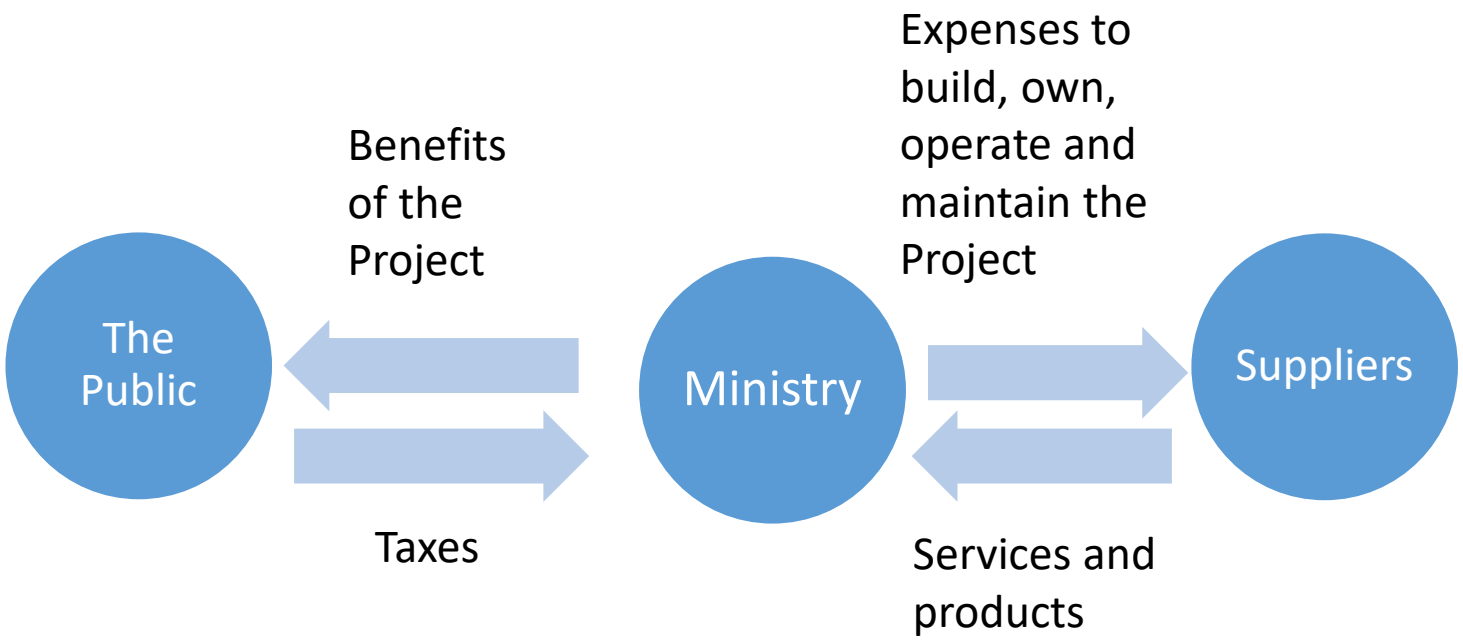
- There are several other webinars in this series covering many other aspects of public-private partnerships.  A listing will be provided at the end of this presentation.
- Some viewers have a background in **project finance** and others have a background in **public procurement**, but not everyone has a background in both

# Life Cycle Cost Analysis (LCCA) in Public Procurement

# Traditional Cost/Benefit Analysis in Public Procurement

- Government Ministry allocates **public funds** to pay for infrastructure development, such as a road, power plant, or water supply system
- The Ministry develops a **specification** describing their requirements
- Bidders offer tenders/proposals to build the infrastructure and state their price
- The Ministry selects the lowest–price tender/proposal that is **compliant** with the specification
- The Ministry **owns** and **operates** the infrastructure
  - Pays all costs for the life of the project (e.g., labor, fuel, spare parts) and may receive revenue (tolls, tariffs, fees)
- The Public enjoys the benefits
  - Faster/safer travel; better health and education; cleaner, cheaper, more reliable electricity; etc.

# Location of Costs and Benefits – Typical Project



# The Role of Life Cycle Cost Analysis (LCCA)

- Traditional procurement is based on **"ticket price"** – how much do I have to pay today?
- "Ticket price" procurement is transparent, but can lead to bad decisions if the procurement has large lifecycle costs and/or benefits
- LCCA is a better alternative for **long-lived projects** with significant costs/benefits over time
  - Evaluates the total costs and benefits experienced during a project's lifetime, adjusted for the time value of money

# The Role of Life Cycle Cost Analysis (LCCA)

- LCCA supports a **longer-term** view of costs and benefits
  - Operations and maintenance costs
  - Periodic repair and replacement costs
  - Cost of downtime
  - Revenue earned or social benefits created over time
  - Disposal and other end-of-life costs and benefits
- LCCA requires **more data** and **more analysis** than "ticket price" procurement, but ensures that all costs and benefits are accounted for

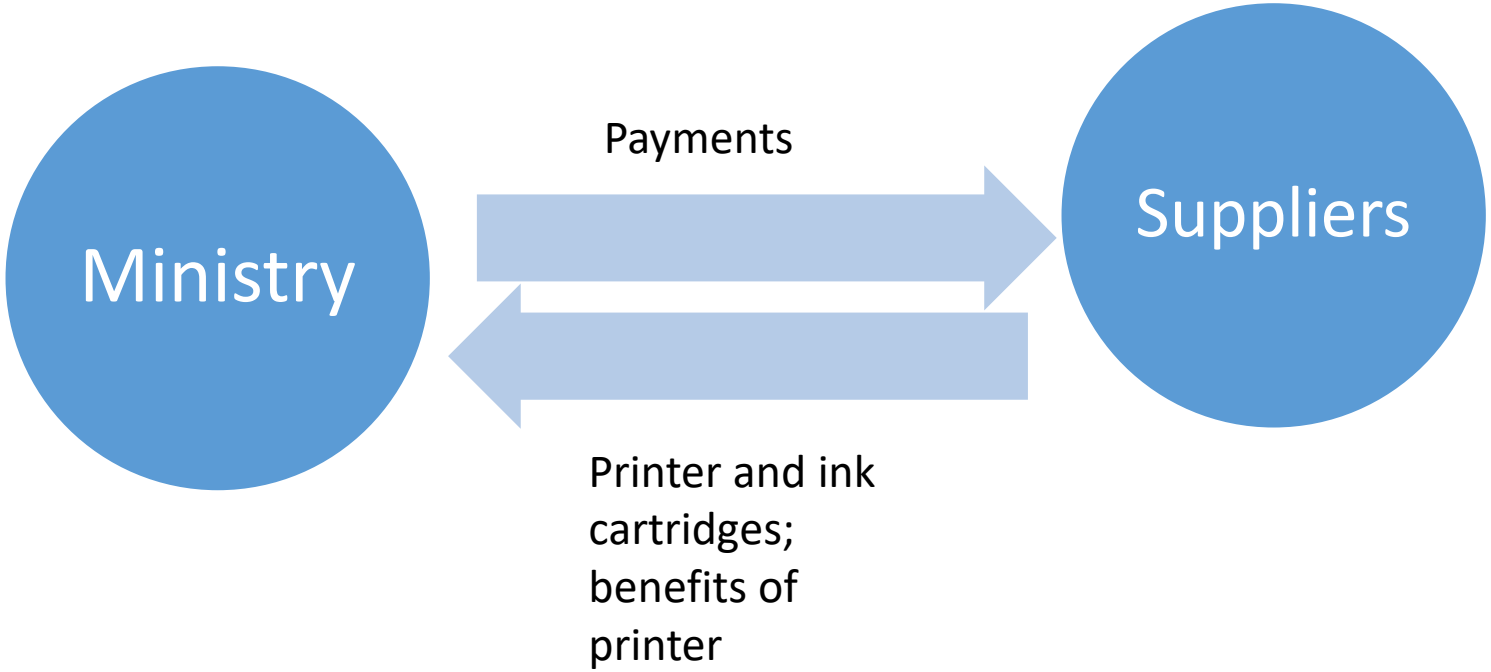
# Simple Example

- You have a choice of two computer printers with identical performance (printing speed, color quality, paper handling, etc.)
  - **Printer A** costs **$150**
  - **Printer B** costs **$100**
- **Printer A** uses **4** color ink cartridges that will each print 5000 pages, and cost **$5** to replace
- **Printer B** uses **5** color ink cartridges that will each print 5000 pages, and cost **$10** to replace

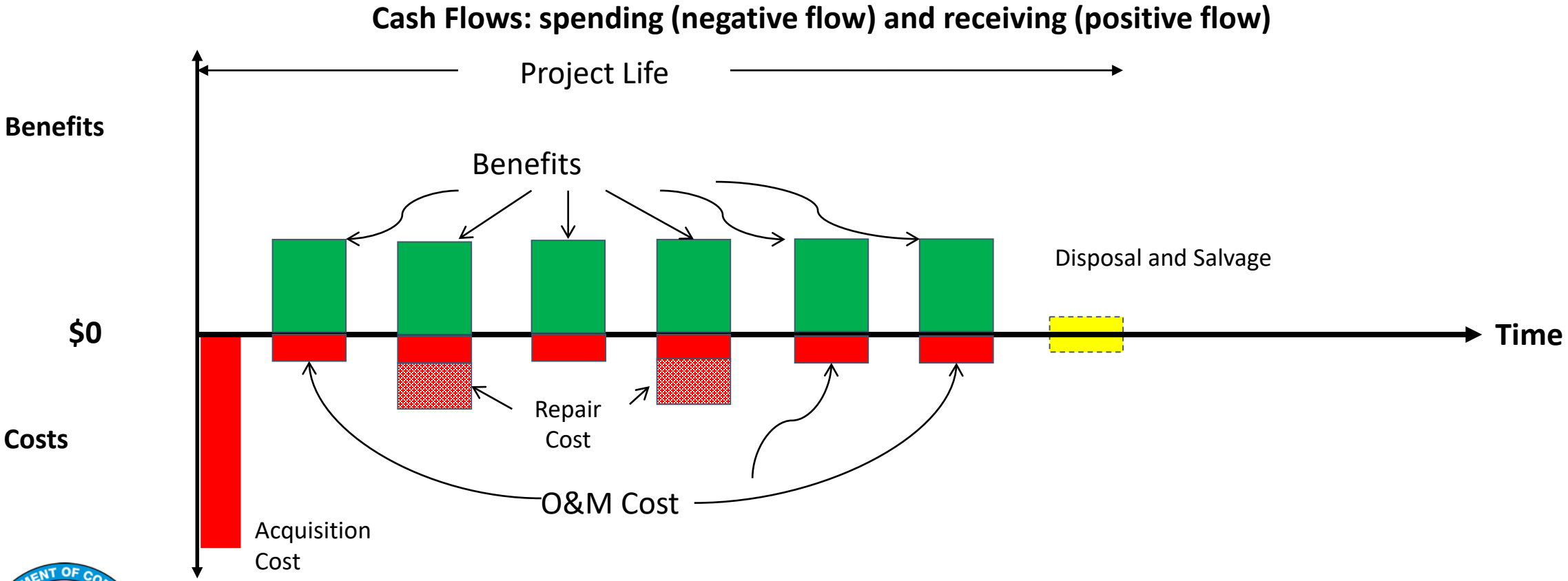
# Simple Example - Continued

- You expect to print 10,000 pages per year
  - **Printer A yearly cost** = 4 cartridges x 2 replacement cycles x $5/cartridge = **$40/year**
  - **Printer B yearly cost** = 5 cartridges x 2 replacement cycles x $10/cartridge = **$100/year**
- Assume that both printers would last 3 years. Cost?
  - **Printer A** = $150 + $40 + $40 + $40 = **$270**
  - **Printer B** = $100 + $100 + $100 + $100 = **$400**
- Which is the better choice on an "ticket price" basis? On an LCCA basis? Which is the **better choice**?
- Which printer would your organization choose?

# Location of Costs and Benefits – Printer Example



# Life Cycle Cost Analysis – Conceptual



# Why do we discount future cash flows?

- Money promised in the future is **worth less** than money today
- You **“erode”** the value of money in the future using a **“discount rate”**
- Did we discount future cash flows in our printer example?

Money in hand today is worth more than money promised at some point in the future

# How are Future Cash Flows Discounted?

***Present Value*** **(PV) of $1.00 at "n" years in the future = $1.00 / (1+*i*)$^n$**

- *i* = discount rate, *n* = number of years into the future
- Example: Assume that the discount rate is 6%. One dollar in Year Five is worth how much today?
    - $\$1.00/(1+.06)^5$
    - **Calculation by hand** (starting with the denominator):
        - (1.06) x (1.06) x (1.06) x (1.06) x (1.06) = 1.338226
        - $1 / (1.338226) = $0.75
    - **Using a calculator ($y^x$ function),** press:
        - $1 / (1+.06) $y^x$ 5 = $0.75
    - **Excel**, enter:
        - +$1/(1.06)^5 = $0.75

# The Discount Rate

- Selecting the **discount rate** is based on several considerations
  - Inflation expectations
  - The cost of capital (e.g., the interest rate on government debt of similar length to the project; the cost of private borrowing)
  - The potential alternative return if the capital is invested elsewhere
  - Risks of comparable investments
- No perfect answer
  - A company may have a standard rate or formula
  - For government, the discount rate may be determined by the Finance Ministry
  - How do you do it?

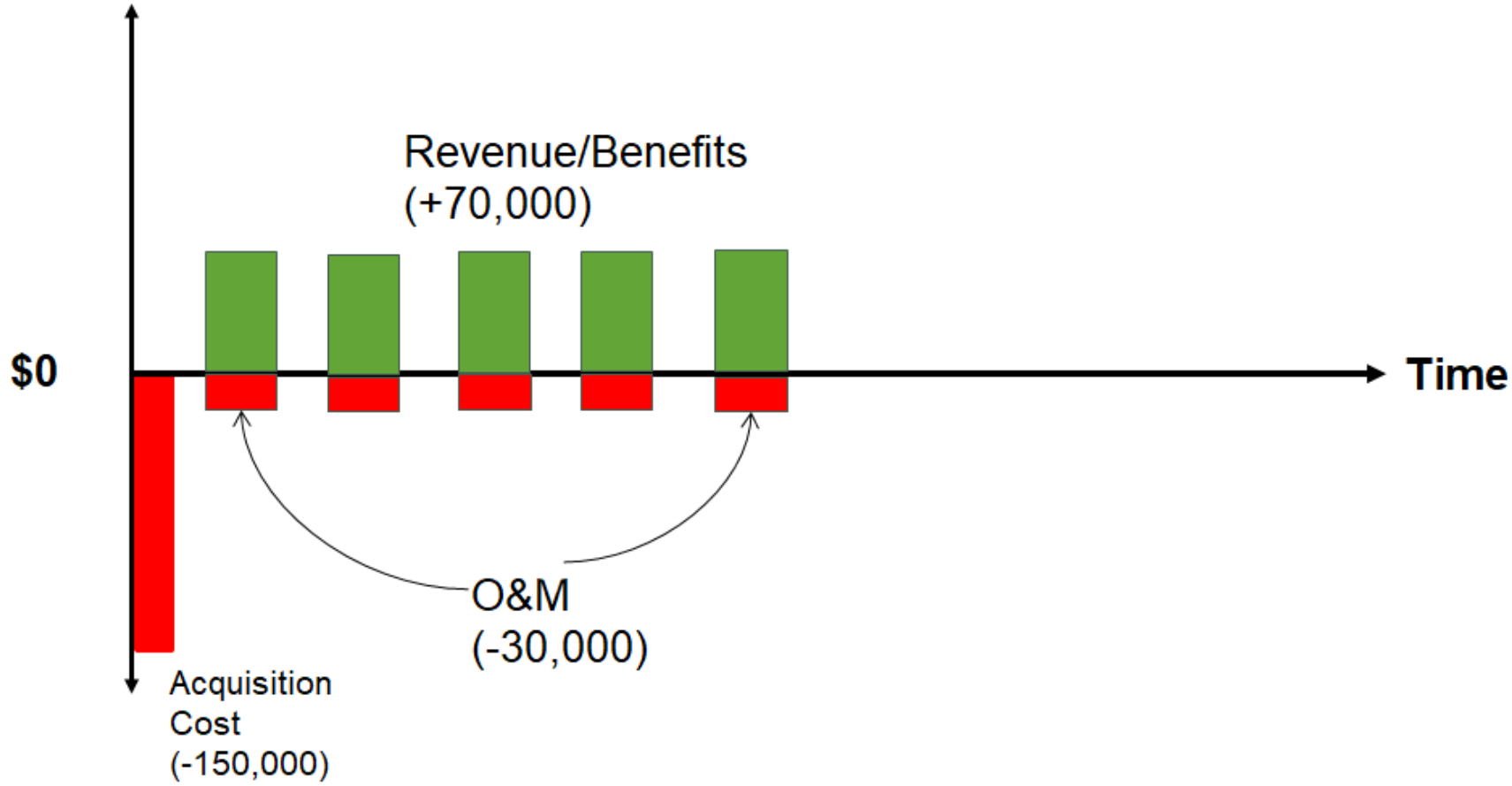
# Common LCCA Analytical Methods

- **Net present value** (NPV)
  - Difference between present value of cash inflows and outflows.
  - Metric = present-day dollars
- **Internal Rate of Return** (IRR)
  - The discount rate that makes the NPV of all cash flows from a particular project equal to zero.
  - Metric = discount rate (%)

# Simple Example – Pencil and Paper Exercise

- **Invest** 150,000 in Year 0
- Annual operating cost = -30,000
- Annual revenue = 70,000
- **Net** annual revenue = 40,000
- No salvage value or disposal cost at the end of the project
- Analyze for **5 years**
- Discount rate = **5%**

# Keep the Cash Flow Model in Mind



# Problem Setup

***Present Value*** **(PV) of $x at "n" years in the future = $x/(1+*i*)$^n$**

| Year (n) | Undiscounted Cash Flow (x) | Discount Factor $(1+.05)^n$ | Present Value of Cash Flow = $x/(1+.05)^n$ |
|---|---|---|---|
| 0 | -150,000 | | |
| 1 | 40,000 | | |
| 2 | 40,000 | | |
| 3 | 40,000 | | |
| 4 | 40,000 | | |
| 5 | 40,000 | | |
| Net Present Value | | | ??? |

# Pause Here To Do the Math

- Hit the **Pause** button to stop the webinar
- Calculate the discount factors
- Calculate the Present Value of each Cash Flow
- Calculate the Net Present Value
- Then hit **Play** to resume the webinar

***Present Value*** **(PV) of $x at "n" years in the future = $x/(1+*i*)$^n$**

| Year (n) | Undiscounted Cash Flow (x) | Discount Factor $(1+.05)^n$ | Present Value of Cash Flow = $x/(1+.05)^n$ |
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| 0 | -150,000 | | |
| 1 | 40,000 | | |
| 2 | 40,000 | | |
| 3 | 40,000 | | |
| 4 | 40,000 | | |
| 5 | 40,000 | | |
| Net Present Value | | | ??? |

# Problem Solved

***Present Value*** **(PV) of $x at "n" years in the future = $x/(1+*i*)$^n$**

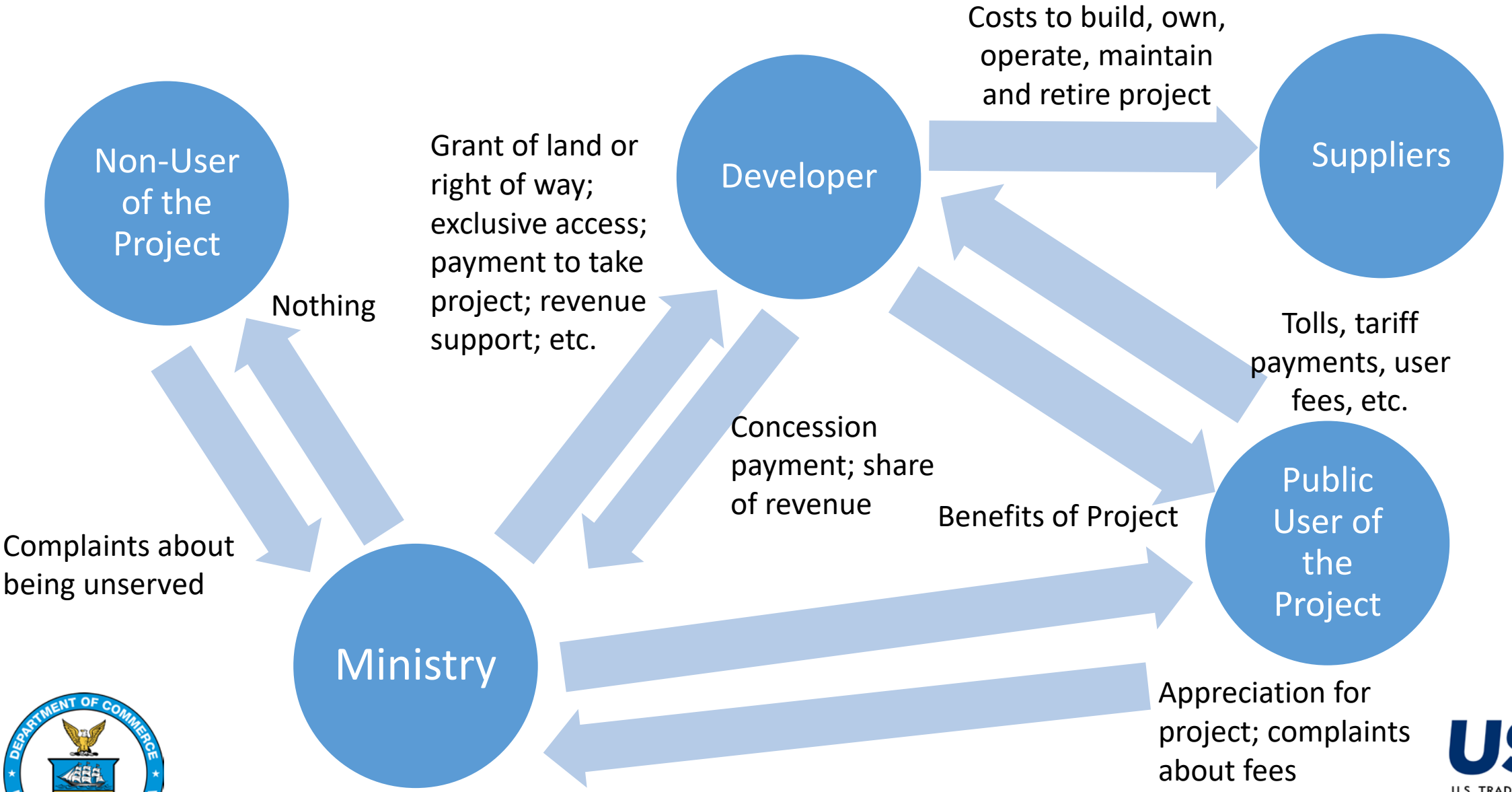
| Year (n) | Undiscounted Cash Flow (x) | Discount Factor $(1+.05)^n$ | Present Value of Cash Flow = $x/(1+.05)^n$ |
|---|---|---|---|
| 0 | -150,000 | 1 | -150,000 |
| 1 | 40,000 | 1.05 | 38,095 |
| 2 | 40,000 | 1.1025 | 36,281 |
| 3 | 40,000 | 1.1576 | 34,554 |
| 4 | 40,000 | 1.2155 | 32,908 |
| 5 | 40,000 | 1.2763 | 31,341 |
| Net Present Value | | | 23,179 |

# Life Cycle Cost Analysis (LCCA) in Public-Private Partnerships (PPPs)

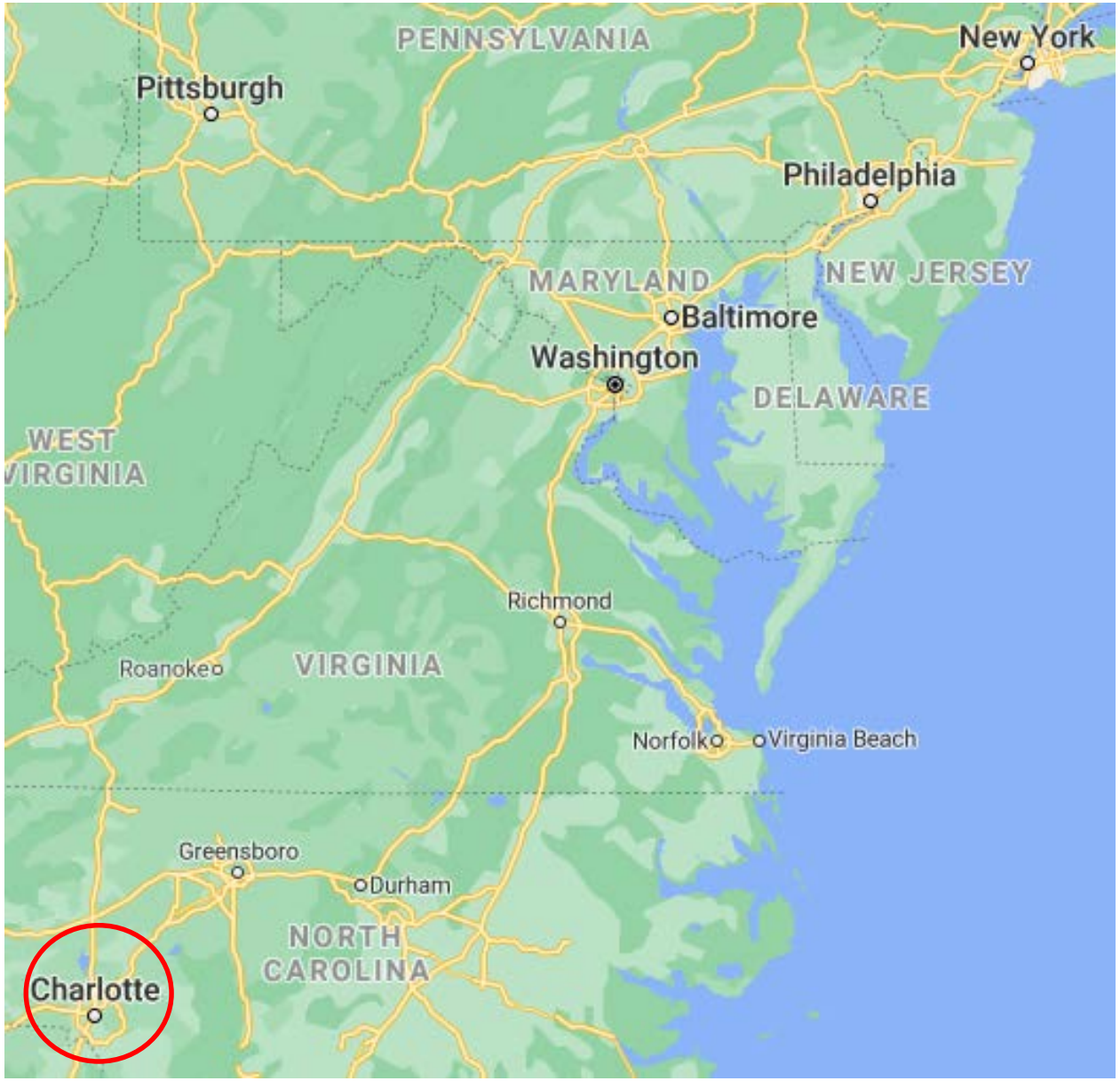
# Application of LCCA to Public-Private Partnerships

- LCCA is an essential tool for evaluating the **price aspects** of PPPs
  - Typically long-lived projects and contracts
  - Typically substantial costs and benefits in each year of operation
  - End-of-contract costs or benefits need to be considered
- LCCA within a PPP must address **additional complexity**
  - Whose perspective does the LCCA reflect?
  - How are costs and benefits allocated among the contractual parties and other stakeholders?
- Case Study – Toll Road PPP in the U.S. city of Charlotte, North Carolina

# Location of Costs and Benefits - PPP



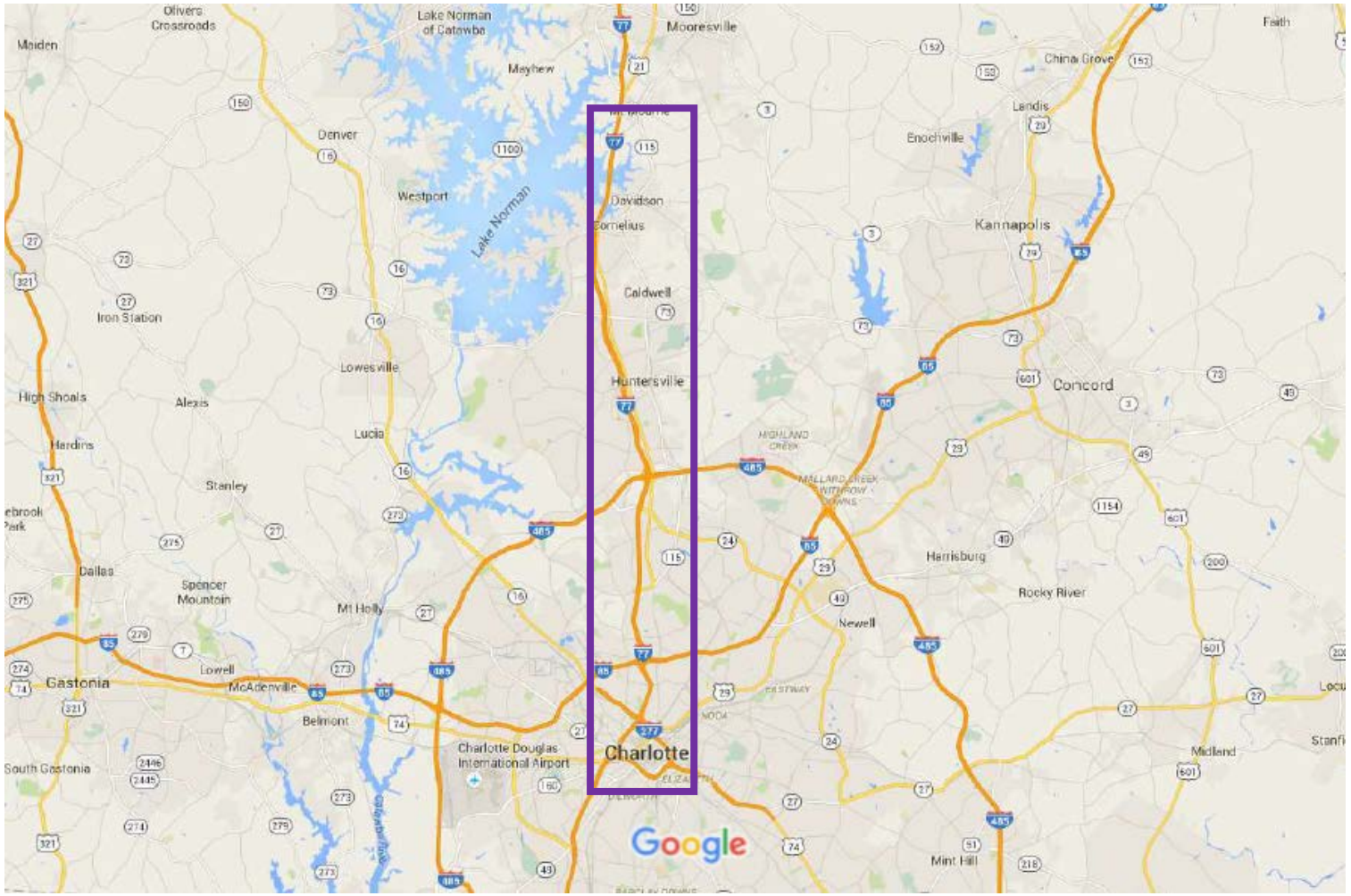
# Project Area



# Project Concept

- Interstate 77 becoming **congested**
- **PPP concept**
  - Convert existing High Occupancy Vehicle (HOV) lanes into High Occupancy Toll (HOT) lanes with variable toll rates that increase with congestion
  - Add additional HOT lanes in each direction where there are no existing HOV lanes
  - 50-year PPP

# Project Area




Project covers 42 km of Interstate 77

# Whose Perspective?

- North Carolina Department of Transportation (NCDOT)
  - LCCA goal – **minimize** long-term cash **expense** to the State budget
- Developer
  - LCCA goal
    - Submit a winning tender/proposal
    - **Maximize return** on capital employed consistent with project risks
- Motorists **using** the toll lanes
  - LCCA goal – keep tolls low
- Motorists **not** **using** the toll lanes
  - LCCA goal – fund the new lanes with tax money; eliminate tolls

# NCDOT Wrote the Request for Tenders/Proposals

- **No ceiling** on toll rates – increases developer revenue, reduces NCDOT future costs
- **Promise** to build no new General-Purpose Lanes – increase likelihood of congestion, increases toll revenue for developer
- Offer up to $170 million in public funding
- Offer to **assume** part of the revenue **risk** if toll lane usage falls below forecast
- LCCA evaluation formula (lowest score wins):

Life Cycle Cost to NCDOT = [PFA or CP] + Risk Adjusted DRAM Cap – TQC

# Payments during the Design/Construction Period

- **PFA** – money paid by North Carolina to the concessionaire
  - Offeror may choose to propose or not
  - Capped at $170 million nominal
  - Quarterly draw over a 5-year period
  - Brought to present value at 5%
- **CP** – money paid by the concessionaire to North Carolina
  - Offeror may choose to propose or not
  - Upfront lump sum offer (already present value)

LCC to NCDOT = [**PFA or CP**] + Risk Adjusted DRAM Cap – TQC

# Developer Ratio Adjustment Mechanism (DRAM)

- **Additional** financial **support** provided by North Carolina to developer
- Intended to (partially) fill the gap between actual project revenues and the amount needed to service project debt if actual revenues fall short of projections
- Available after Substantial Completion but before maturity of publicly-funded loan
- Capped at $75 million total, $12 million in any one-year, nominal dollars, not discounted
- **Risk Adjusted DRAM Cap** = DRAM Aggregate Cap Amount multiplied by 0.10
- Developer must request a DRAM cap in their tender. Can be zero.

LCC to NCDOT = [PFA or CP] + **Risk Adjusted DRAM Cap** – TQC

# Technical Score Converted to Money

- 200 possible technical points
- **TQC** = Technical Score Quality Credit, which is determined by multiplying the Technical Score x $375,000
- Maximum value = $75 million  (200 x $375,000)

LCC to NCDOT = [PFA or CP] + Risk Adjusted DRAM Cap – **TQC**

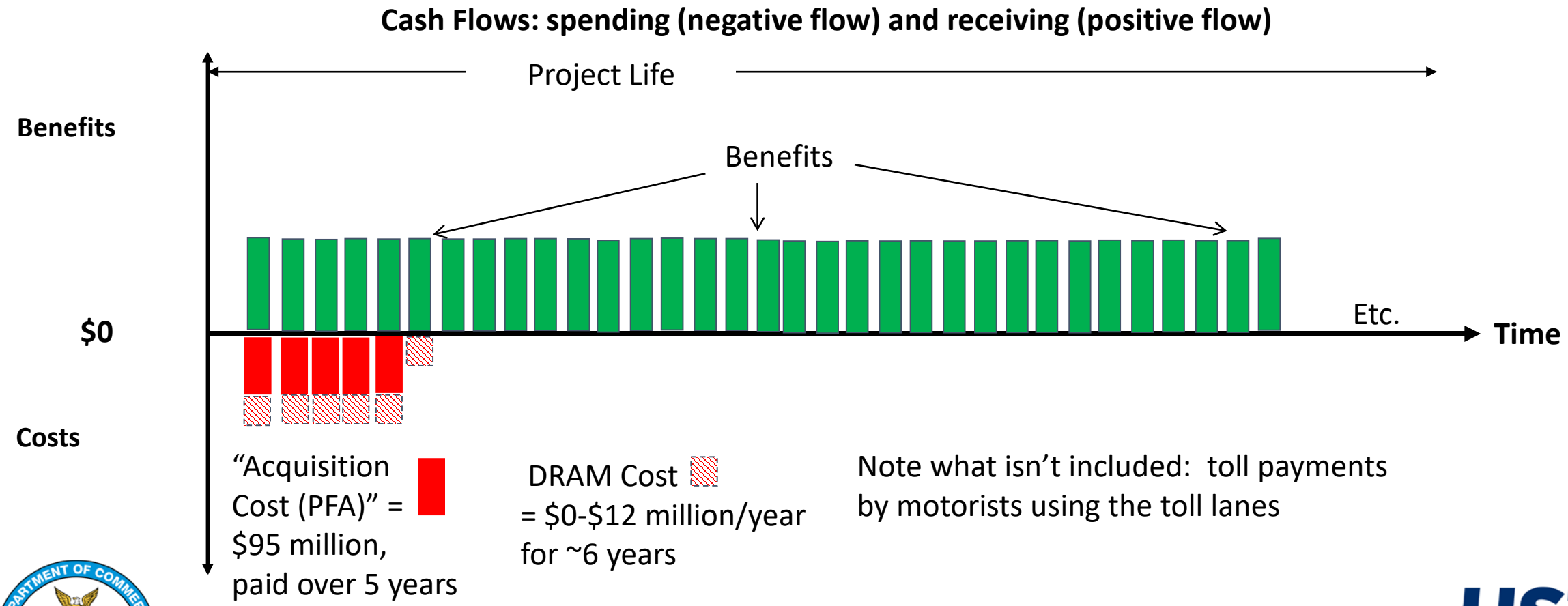
# LCCA Discussion

- NCDOT's LCCA **formula addressed** the life cycle costs that might affect **them**
- Some elements brought to present value
  - CP
  - PFA
  - TQC
- Risk Adjusted **DRAM Cap** was not brought to present value

# The Winning Proposal:  NCDOT's LCCA

- $0 CP
- $95 million Public Funds Amount
- Possibility (only 10%?) of additional $75 million DRAM, undiscounted
- TQC not revealed

# Life Cycle Cost Analysis – NCDOT View



# What is the Motorist's LCCA?

The Charlotte Observer

**I-77 toll lanes have cut rush-hour travel times, operator says. Not everybody's happy.**

"But every dime a person spends on private tolls is one less dime in our local economy," he wrote. "One more dime prolonging the tyranny of private tolling. One more dime enabling a private company to profit off of public misery. I don't see how anyone could support that. As a community I hope we remember that. (Personally, I wouldn't mind having the purchase of a QuickPass become a litmus test disqualifying a candidate for public office.)"

July 12, 2019

The Washington Post

**High toll along I-66 in Northern Virginia and heavy traffic for Wednesday commute**

The toll along I-66 lanes, inside the Beltway, reached $45.50 just before 9 a.m. The toll prices are dynamic and change every six minutes, depending on speed and traffic volume.

November 7, 2018

# Public Reaction

- **Anger** in local communities
  - 50 years of uncapped tolls on HOT lanes
  - No new General-Purpose lanes
  - Suspicion that the public budget could have paid for new lanes with no tolls
- Long term **risks** to public budget
  - $95 million PFA
  - Possibility of $75 million DRAM
  - $100 million tax-exempt bonds issued by North Carolina government (not part of the LCCA)
  - $215 million loan from U.S. government (not part of the LCCA)
  - What if the developer goes bankrupt?
- Governor of North Carolina **defeated** at next election

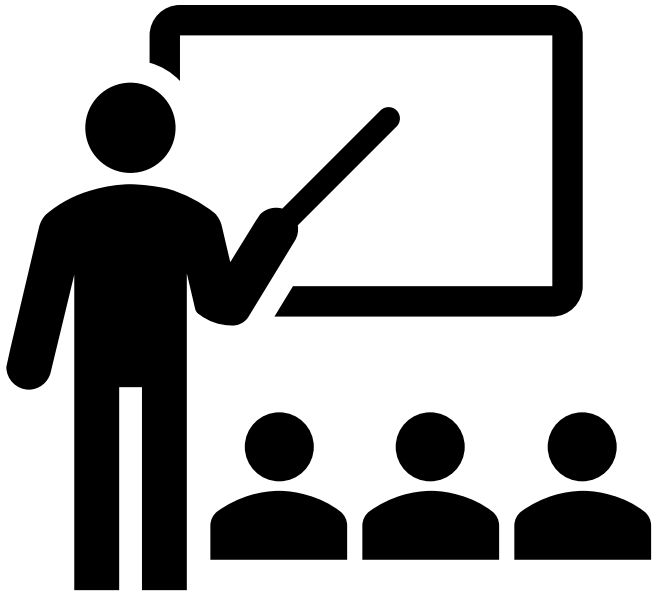
# Conclusion

- LCCA is a better way to **evaluate costs and benefits** of long-lived projects compared with traditional “ticket price” evaluation
- LCCA can and should be used in PPPs, but needs to be carefully **designed**
  - Have the costs and benefits affecting all stakeholders been evaluated from their perspective?
  - Is the project reasonably equitable?

# Thank You

# Previous Webinars

- **Project Finance**
- **Screening Tools**
- **Pre-Feasibility Studies**
- **Pre-Qualification and Evaluation**
- **Sector Specific: Pre-Feasibility Studies**
- **Business Case Development**
- **Unsolicited Proposals**
- **Financial Modeling**



# Access Previous Recordings

**Go to:**

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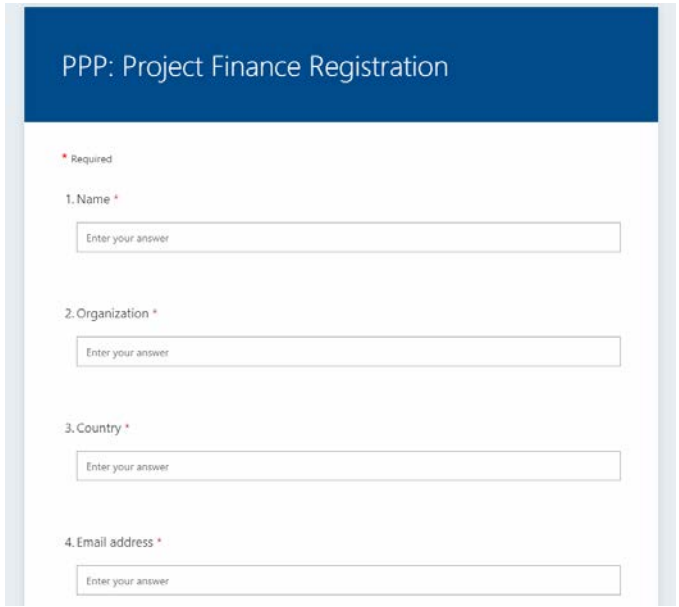
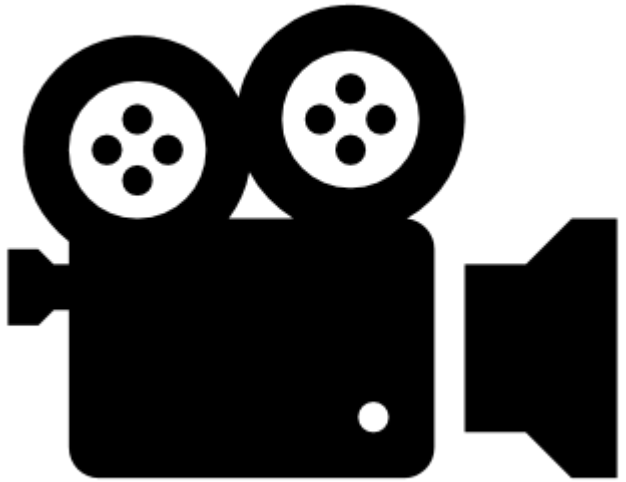



**Watch**

# Upcoming Webinars

- **Debt financing risk**
- **Commercial Contracts**
- **Contract Management**
- **Social PPPs**



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