Incremental Changes and Disruptive Impacts in Tolling

- Outline
  - *Incremental Changes – From 1990 to Today,*
  - *The Way It Was - Tickets & tolls charged by trip length and vehicle size,*
  - *The Way It Changed – Tolls charged by plaza location and vehicle size,*
  - *How We Build 'em Now: Tolls charged by trip length, vehicle size, and…*
  - *Impacts on pricing, planning, and public policy,*
  - *Impacts on systems and operations,*
  - *The way it will be… maybe.*

Incremental Changes – Beginning in 1990

- The Major Events of 1990:
  - *The Reunification of Germany,*
  - *The Baltic States break free from the Soviet Union,*
  - *Saddam Hussein attacks Kuwait, AND*
  - ***IBTTA plans the first AVI conference!***

TOLLWAYS

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March 1990

Technical Program Set For June AVI Symposium

The preliminary program for IBTTA's international symposium on Automatic Vehicle Identification (AVI) Technology For Toll Collection has been set and is being distributed to IBTTA members and others along with registration materials. The conference is scheduled for June 17-20, 1990, at the Sheraton Centre Hotel in New York, New York.

The Regional Interagency AVI Policy Committee and eight Active Members are co-sponsoring the symposium. The eight are: AISCAT (the Italian Toll Association); COFIROUTE (a private toll road company in Paris, France); New Jersey Highway Authority; New Jersey Turnpike Authority; New York State Thruway Authority; Pennsylvania Turnpike Commission; The Port Authority of New York & New Jersey; and Triborough Bridge & Tunnel Authority.

Jean Mesqui, Directeur General, Societe de l'Autoroute Paris-Normandie (SAPN), will give the keynote address. Mesqui is widely respected worldwide for his contributions to the field of AVI technology. Senator Frank

Spring Workshop Program to Feature Latest Developments in Toll Industry

Toll industry officials and others will gather in Norfolk, Virginia for IBTTA's Spring Workshop on the water at the Omni International Hotel. The meeting is scheduled for April 29—May 1.

Four panel discussions and two special presentations will give delegates to IBTTA's Spring Workshop a broad overview of the latest developments in the toll industry.

Lafont   *Zilocchi*   *Mohn*

Incremental Changes – Since 1990

- IT developments
  - *Processing power –*
    - 1990: 80486 w 11.1 MIPS @ 33MHz
    - 2015: Intel CORE i7 with over 100,000 MIPS @ over 3 GHz!
  - *Data storage – from KB to TB*
  - **Communications bandwidth from bits to mega blocks.**
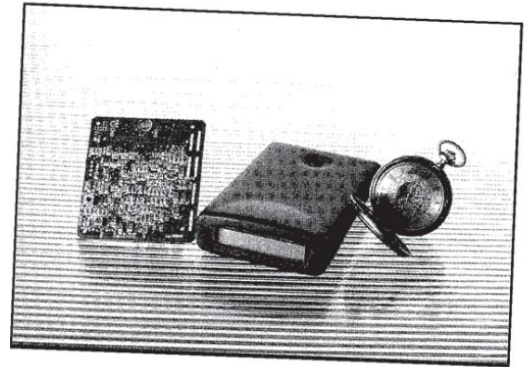
Incremental Changes – Tools of Our Trade

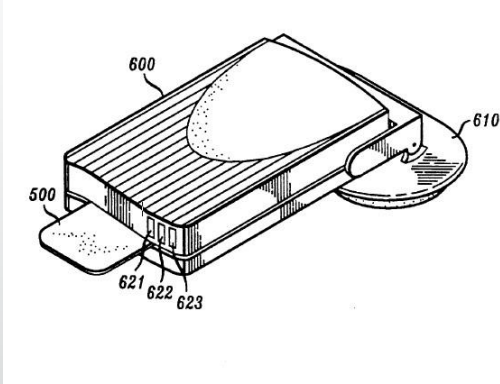- In 1990, they were
  - *Coin Machines*
  - *Treadles*
  - *Gates*
  - *Cash*

Incremental Changes – Tools of Our Trade

- Today, the tools of the
  - *Transponders,*
  - *Cameras,*
  - *Vehicle Classification L...*
  - ***PROCESS REPORTS.***

Incremental Changes – Industry Disruption

- *A Valid Tag list of 45 million? OK*
- *Storage of millions of images in the field? OK*
- *OCR/ALPR in the field? OK*
- *Single open-source format for transactions (that is, an AVI read or video transaction are set up the same)? OK*
- *This in turn enables:*
  - *Processing multiple transponder protocols for accountholders from anywhere,*
  - *Much improved video toll processing for non-accountholders, so…*
  - ***No new toll programs include cash toll plazas.***

Incremental Changes – Industry Disruption

- If we don't need cash tolls, then a plaza like this:

- Is replaced with a toll zone like this:

  - *10% of capital cost of a plaza,*

  - *No additional ROW,*

  - *No staffing,*

  - *No gates or machines,*

 - *No incremental cost per transaction.*

Incremental Changes – Industry Disruption

- From an Engineering Perspective, AET is compelling,
- In Operations, however, everything is changed:
  - *Operations staffing and contracts,*
  - *Integrated or independent systems,*
  - *Operations, finance and performance reporting,*
  - *"variance vs. leakage,"*
- And – The Tolling Environment is Altered,
  - *The way tolls are set, measured and posted is changing,*
- **And the Disruption Keeps on Coming.**

The Way It Was - *Tickets & Tolls*

- 40's and 50's toll roads set tolls by trip length and vehicle size, using tickets issued on entry,
- "Trumpet" interchanges,
- Massive traffic tie-ups
  - *even in the early days,*
- Difficult to improve,
- High fixed staffing costs,
- Not used after the 60's as most long-distance highways were built as part of Interstate system.

The Way It Was - *Tickets & Tolls*

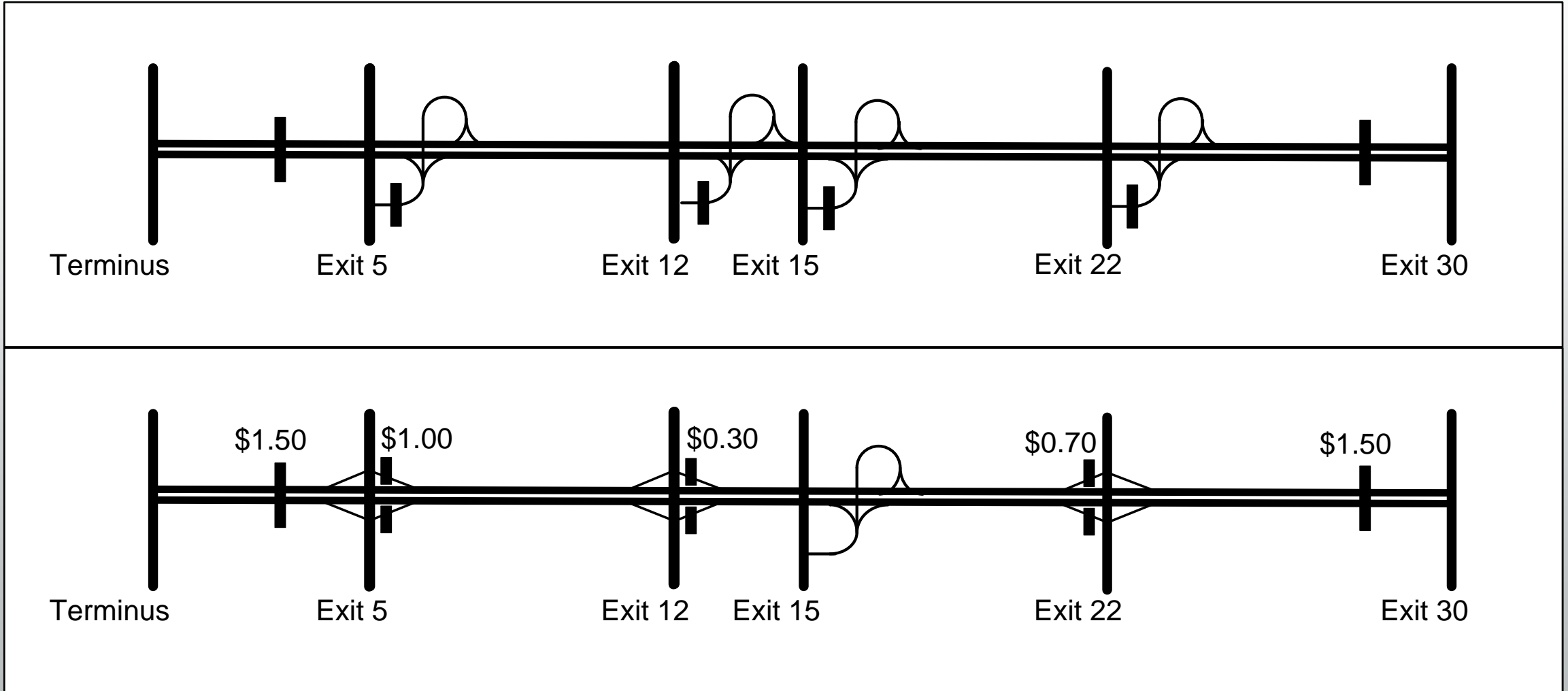Terminus   Exit 5   Exit 12   Exit 15   Exit 2
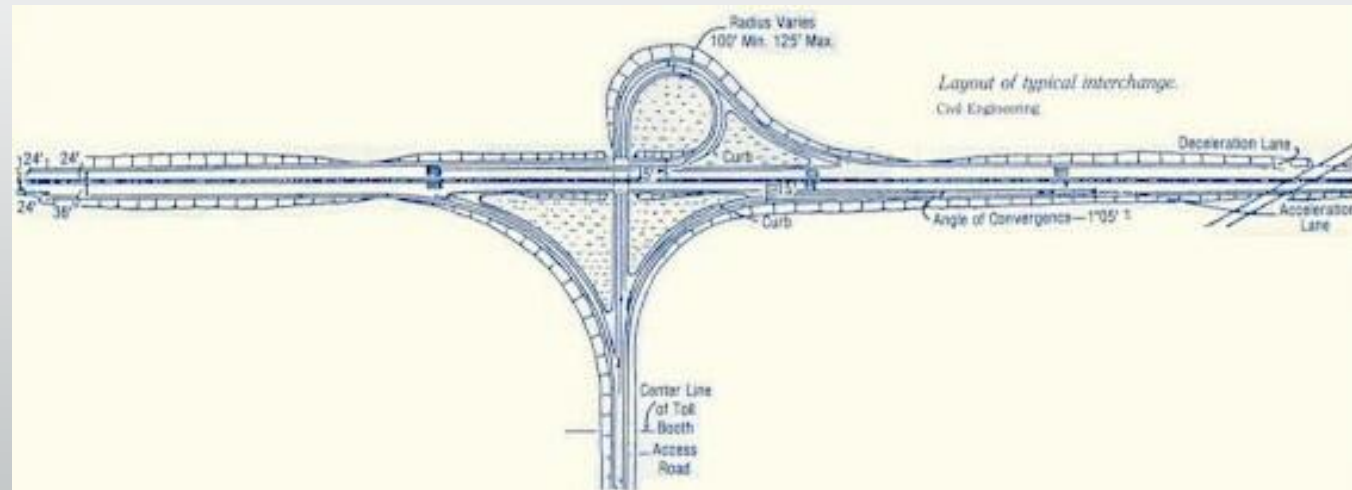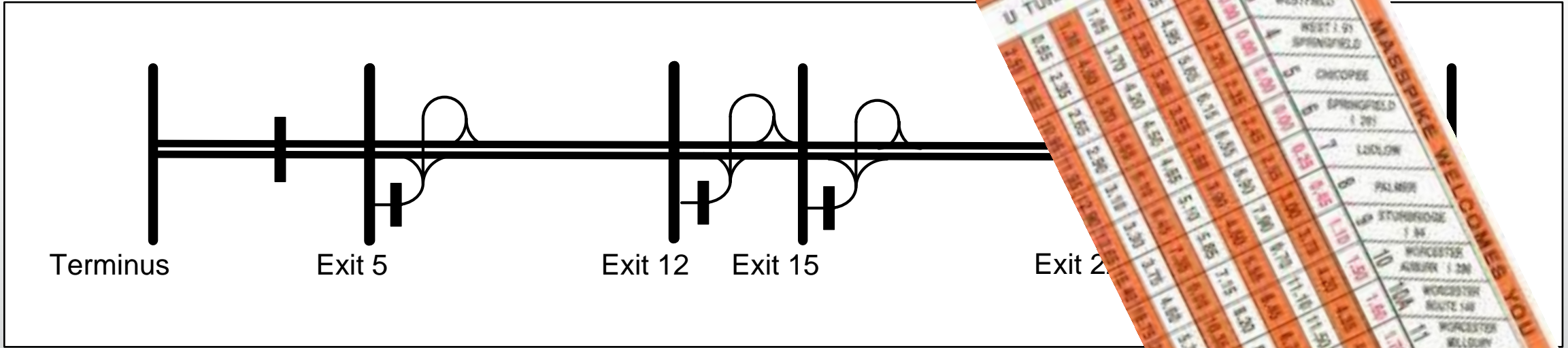
- Get ticket at entry, surrender at exit – the pair of locations sets the trip length and the toll.
- Vehicle throughput was very slow because of the wide range of possible tolls owed at any point.

The Way It Changed – *Tolls Set by Plaza Location*

Terminus   Exit 5   Exit 12   Exit 15   Exit 22   Exit 30

$1.50 $1.00 $0.30 $0.70 $1.50

Terminus   Exit 5   Exit 12   Exit 15   Exit 22   Exit 30

- This hypothetical example depicts a 10-cent per mile toll scheme.

MIAMI, FL JULY 12-14, 2015

Summit on All-Electronic Tolling, Managed Lanes & Interoperability

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The Way It Changed – *Tolls Set by Plaza Location*

- Mainline barrier toll plazas every 10 to 25 miles apart,
- Ramp toll plazas to ensure all trips incur a toll, but...
- No need for trumpet interchanges,
- Longer trips = more barrier plazas = more tolls,
- Fixed toll = Easier and faster for drivers,
- Easier to automate and improve with coin machines,
- Easier to automate and improve <u>further</u> with AVI,
- The choice for all newer US toll facilities after the 60's... until recently

The Way It Changed – *Tolls Set by Plaza Location*

- Operational and Service Problems:

$1.50 $1.00 $0.30 $0.70 $1.50

Terminus   Exit 5   Exit 12   Exit 15   Exit 22   Exit 30
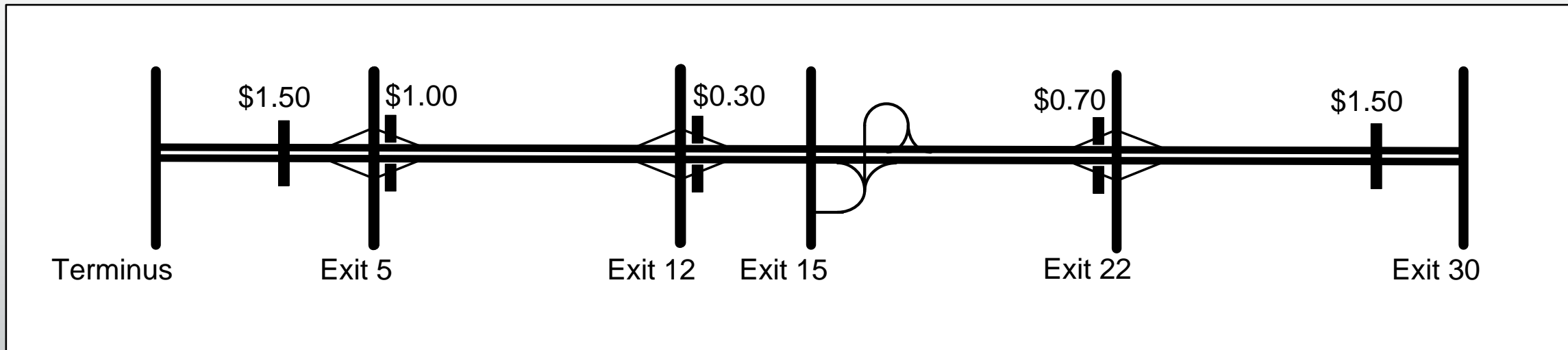
- ***Toll inequity*** *– unbalanced rates for intermediate movements,*
- *A driver from Terminus to Exit 5 pays $1.50 to travel 5 miles = $0.30 / mile! Three times the nominal rate.*

How We Build 'em Now

Terminus   Exit 5   Exit 12   Exit 15   Exit 22   Exit 30
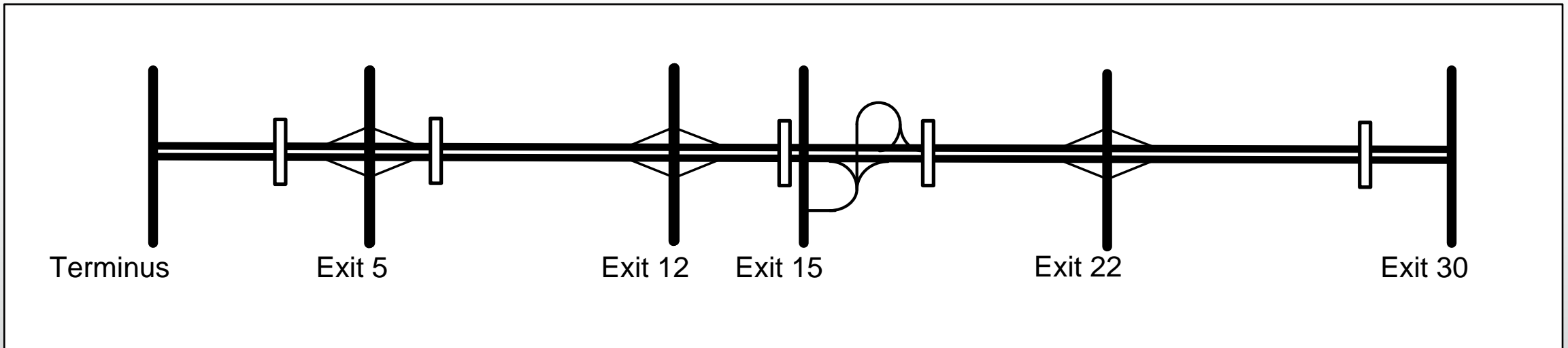
- Now, with inexpensive toll zones and all this technology, toll zones located:
  - *Between each interchange,*
  - *No ramp movements.*

How We Build 'em Now – *It's More Complicated...*

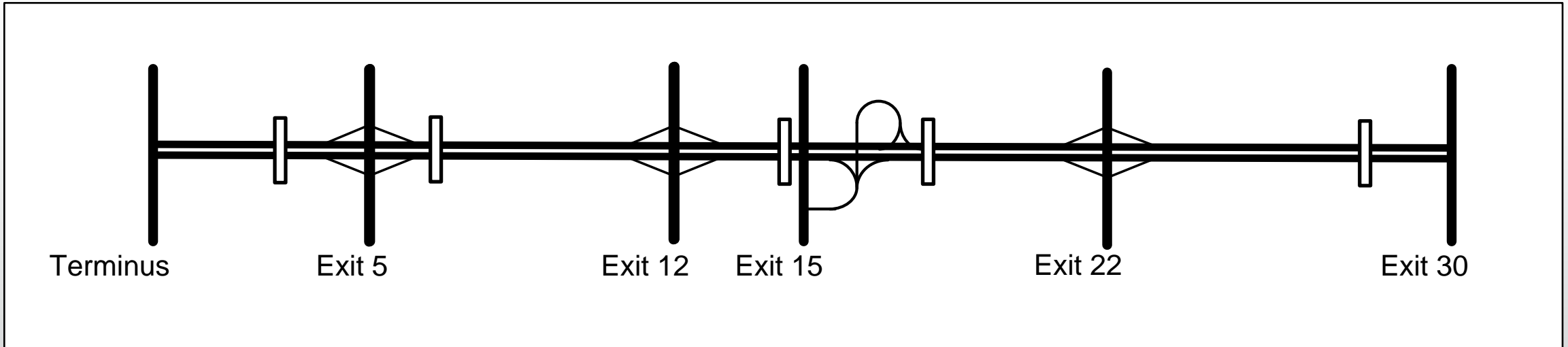Terminus   Exit 5   Exit 12   Exit 15   Exit 22   Exit 30

- *A lot of toll points, a lot of transactions, might be a lot of video,*
- *"Per transaction" operating costs can skyrocket,*
- Trend is to instead combine point tolls into a single trip toll...
- ....Which certainly adds complexity.

How We Build 'em Now

- Nonetheless, in fact this is what is being developed today:
  - *Trip length can be measured as with the original ticket system,*
  - *Customers don't recognize or remember toll zones, but **do** understand trips they drive,*
  - *Easier support of variable pricing by time-of-day or congestion-based,*
  - *NO ramp plazas impeding improvements,*
  - *Traffic Impact: interchanges can be designed without toll plaza considerations,*
  - ***Equity Impact: rates can be set on true per-mile rates or based on other business rules without plaza constraints.***

How We Build 'em Now

- Has been used for managed lanes projects.

- Being used in new AET projects:

    - *Maryland Inter County Connector (open to traffic),*

    - *I-95 / I-495 Washington Beltway projects (open to traffic),*

    - *Illinois Elgin-O'Hare Expressway (in development),*

    - *Massachusetts Turnpike (in development),*

    - *Central Florida: CFX / FTE Wekiva Parkway (in development).*

How We Build 'em Now

MD 200 – Inter County Connector Toll System

Impacts on Pricing, Planning and Public Policy

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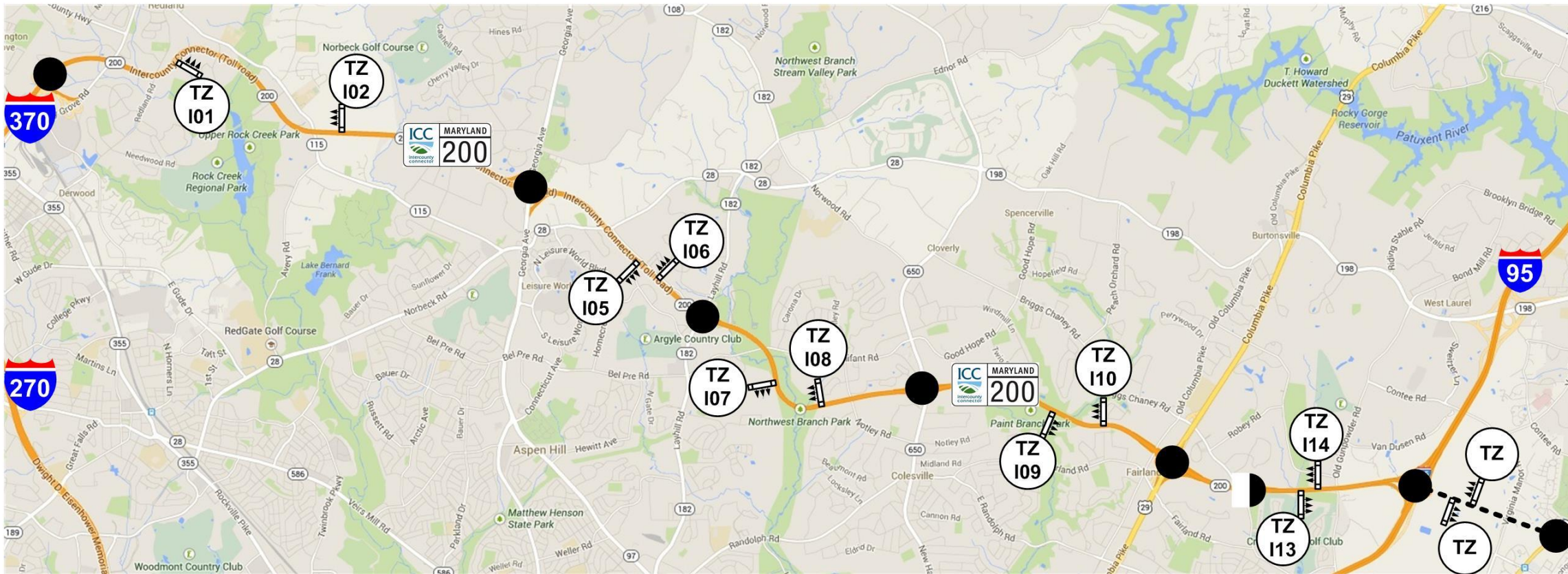
- When tolling expressways designed to be freeways:

  - *Eastern US Interstates often have 2- to 3-mile interchange spacing, (toll roads typically have greater interchange spacing),*

  - *With new tolls, local free movements likely to be required,*

  - *Diversion will be possible, new tolls at each point must be low,*

  - *Toll zones about 5 miles apart seems a good balance of economy, low point toll rates, and free local movements. This will vary by state and urban density,*

  - ***This type of design will necessitate massive quantities of data collection and trip-building.***

Impacts on Systems and Operations

- Needed:
  - *Automated multiple-image matching and processing,*
  - *Get as many people with transponders as possible,*
  - *Clear reporting and tracking of point transaction disposition:*
    - lane -> bundled transaction -> posting,
  - *CSR screens with composition of trip transactions,*
  - *Clear documentation of business rules and process requirements.*

You're Past Practice Has Been Disrupted -

- SO WHAT ARE YOU GOING TO DO ABOUT IT?
  - *To the owners:*
    - **Quit customizing everything,**
    - **Don't fall for the Sunk Cost Fallacy,**
  - *To the consultants:*
    - **Get over it, "tolls" is not about plazas and construction specs any more,**
  - *To the systems integrators:*
    - **Get rid of cash-based logic in your systems,**
    - **Get ready for the way it will be...**

The way it will be… maybe.

- The next major disruptive change?
  - *IF every vehicle can be forced to identify itself to the toll operator by merely being on the toll road (some kind of involuntary GPS or vehicle-to-infrastructure reporting process),*
  - ***THEN there would be no need for physical toll zones, just virtual toll zones if any at all!***
  - *If 100% of vehicles can be identified to voluntarily pay through an account or tagged through a violation process, then pure per-mile tolling – or any other pricing policy – can be employed.*

The Next Disruptive Change

- Any Questions?