Planning for Reliability, Economics and Public Policy

November 17, 2011
MISO Planning Objectives

**Fundamental Goal**: The development of a comprehensive expansion plan that meets reliability needs, policy needs, and economic needs

- Make the benefits of an economically efficient energy market available to customers by providing access to the lowest electric energy costs
- Provide a transmission infrastructure that safeguards local and regional reliability and supports interconnection-wide reliability
- Support state and federal energy policy objectives by planning for access to a changing resource mix
- Provide an appropriate cost mechanism that ensures the realization of benefits over time is commensurate with the allocation of costs
- Develop transmission system scenario models and make them available to state and federal energy policy makers to provide context and inform the choices they face

*MISO Board of Directors System Planning Committee 5/16/2011; pending full board approval*
Conditions Precedent to Increased Transmission Build

Before transmission is built a number of conditions must be met:

- Increased consensus on energy policies (current and future)
- A robust business case that demonstrates value sufficient to support the construction of the transmission project
- A regional tariff that matches who benefits with who pays over time
- Cost recovery mechanisms that reduce financial risk
Required: Policy Consensus

Current State Renewable Portfolio Standards
As of 07/27/2011

- MISO believes an informal consensus has been reached regarding appropriate planning for energy policies.
- This belief is based on the widespread implementation of Renewable Portfolio Standards across the MISO footprint and the work of many stakeholders, spearheaded by the:
  - Midwest Governor’s Association
  - Upper Midwest Transmission Development Initiative
  - Organization of Midwest ISO States Cost Allocation and Regional Planning

Planned and Existing Wind as of 3/28/2011

MISO Planned and Existing Wind: 12,408 MW
MISO RPS Mandates: ~ 23,500 MW

Yellow – State with RPS Mandate or Goal
White – State with No RPS Mandate or Goal
To meet the MISO planning goal of providing consumers with access to the lowest cost electric energy, analyses were performed to determine the costs associated with different wind generation siting methodologies.

The low cost approach to wind generation siting, when both generation and transmission capital costs are considered, is a combination of local and regional generation locations.
After additional intensive analysis, the candidate portfolio was refined into a final proposed Multi Value Project Portfolio

<table>
<thead>
<tr>
<th>Proposed Multi Value Projects (MVPs)</th>
<th>State</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Stone-Brookings</td>
<td>SD</td>
<td>345 kV</td>
</tr>
<tr>
<td>Brookings, SD - SE Twin Cities</td>
<td>MN/SD</td>
<td>345 kV</td>
</tr>
</tbody>
</table>
| Lakefield Jct.-Winnebago–Winco–Burt area & Sheldon–Burt area–Webster | MN/IA | 345 kV
| Winco–Lime Creek–Emery–Blackhawk–Hazleton | IA | 345 kV |
| N. LaCrosse-N. Madison-Cardinal & Dubuque Co.-Spring Green-Cardinal | WI | 345 kV |
| Ellendale-Big Stone                 | ND/SD | 345 kV  |
| Adair-Ottumwa                       | IA/MO | 345 kV  |
| West Adair to Palmyra Tap           | MO    | 345 kV  |
| Palmyra-Quincy-Meridiosia-Ipava & Meredosia-Pawnee | MO/IL | 345 kV |
| New Pawnee-Pana                     | IL    | 345 kV  |
| Pana-Mt. Zion-Kansas-Sugar Creek    | IL    | 345 kV  |
| New Reynolds-Burr Oak-Hiple         | IN    | 345 kV  |
| Michigan Thumb Loop Expansion       | MI    | 345 kV  |
| New Reynolds-Greentown              | IN    | 765 kV  |
| Pleasant Prairie-Zion Energy Center | WI/IL | 345 kV |
| Fargo-Oak Grove                     | IL    | 345 kV  |
| Sidney-Rising                       | IL    | 345 kV  |

Proposed Multi Value Project
- 345 kV Proposed
- 765 kV Proposed

Existing/Planned Transmission
- 345 kV
- 500 kV
- 735 kV and above
- DC Line

2011 Proposed Multi Value Project Portfolio
Required: Robust Business Case

- The proposed Multi Value Project Portfolio creates a robust transmission system that provides value under a wide range of policy, economic, and operating conditions.
- Specifically, it:
  - Provides benefits in excess of its costs under all scenarios studied, with its Benefit-to-Cost ratio ranging from 1.8 to 3.0.
  - Maintains system reliability by resolving reliability violations on about 650 elements for more than 6,700 system conditions and mitigating 31 system instability conditions.
  - Enables 41 million MWh of wind energy to meet renewable energy mandates and goals.
  - Provides an average annual value of $1,279 million over the first forty years of service, at the cost of an average annual revenue requirement of $624 million*.
  - Supports a variety of generation policies through utilizing a set of energy zones which support wind, natural gas, and other fuel sources.

*Based on a total portfolio capital cost of $5.2 billion, in 2011 dollars. Final costs are subject to change as actual construction estimates are received.
Multi Value Projects enable a more reliable and efficient transmission system
Multi Value Projects create benefits that are spread across MISO in a manner commensurate with costs.

**Benefit/Cost Ratio Ranges**

<table>
<thead>
<tr>
<th>Zone 1: MN, MT, ND, SD, Western WI</th>
<th>Zone 2: Eastern WI and Upper MI</th>
<th>Zone 3: IA</th>
<th>Zone 4: IL</th>
<th>Zone 5: MO</th>
<th>Zone 6: IN, KY, OH</th>
<th>Zone 7: Lower MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6 - 2.9</td>
<td>2.0 - 3.3</td>
<td>1.6 - 2.8</td>
<td>1.8 - 2.8</td>
<td>1.8 - 3.2</td>
<td>1.8 - 3.0</td>
<td>1.7 - 3.0</td>
</tr>
</tbody>
</table>

**MISO Local Resource Zones**

- **Zone 1:** MN, MT, ND, SD, Western WI
- **Zone 2:** Eastern WI and Upper MI
- **Zone 3:** IA
- **Zone 4:** IL
- **Zone 5:** MO
- **Zone 6:** IN, KY, OH
- **Zone 7:** Lower MI
In the MISO cost allocation approach the business case (i.e. benefits) defines the spread of dollars

- Benefits of Multi Value Projects are spread regionally consistent with the widespread benefits from regional plan
- Economic benefits of Market Efficiency Projects spread farther beyond the local zone
- Reliability benefits of Baseline Reliability Projects primarily stay in the zone in which the reliability issue exists
- Generator Interconnection Projects paid primarily by Interconnection Customer
- Participant funded projects are paid by the party proposing the project
Renewable Integration and Planning Reform in PJM: “Threading the Needle” over a Diverse Footprint

ENERGY BAR ASSOCIATION CONFERENCE
NOVEMBER, 17, 2011

Craig Glazer
Vice President
Federal Government Policy
PJM Interconnection
**PJM as Part of the Eastern Interconnection**

- 24% of generation in Eastern Interconnection
- 27% of load in Eastern Interconnection
- 19% of transmission assets in Eastern Interconnection

**KEY STATISTICS**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PJM member companies</td>
<td>750+</td>
</tr>
<tr>
<td>Millions of people served</td>
<td>58</td>
</tr>
<tr>
<td>Peak load in megawatts</td>
<td>158,450</td>
</tr>
<tr>
<td>MWs of generating capacity</td>
<td>180,400</td>
</tr>
<tr>
<td>Miles of transmission lines</td>
<td>61,200</td>
</tr>
<tr>
<td>GWh of annual energy</td>
<td>794,335</td>
</tr>
<tr>
<td>Generation sources</td>
<td>1,365</td>
</tr>
<tr>
<td>Square miles of territory</td>
<td>211,000</td>
</tr>
<tr>
<td>Area served</td>
<td>13 states + DC</td>
</tr>
<tr>
<td>Internal/external tie lines</td>
<td>142</td>
</tr>
</tbody>
</table>

**20% of U.S. GDP produced in PJM**

As of 7/21/2011
• Overview of Renewable Integration in PJM
• Overview of Planning Reforms
• The Larger National Policy Issues
Fuel Mix of Existing PJM Installed Generating Capacity

- Coal, 76,968, 42%
- Natural Gas, 50,729, 27%
- Nuclear, 33,146, 18%
- Wind, 4,870, 3%
- Hydro, 8,030, 4%
- Solid Waste, 705, 0%
- Oil, 11,212, 6%
- Solar, 1,500, 0%

As of 8/1/2011
SOM 2nd Qtr 2011
Proposed Generation (MW) – Renewables 36,376 / 59%

- Wind, 34,079
- Non-Renewable, 25,736
- Biomass, 218
- Methane, 71
- Solar, 3,721
- Hydro, 382
- Other, 382
- Renewable, 243

As of January 4, 2011
Significance of What Was Decided:

- ROFR
- Endorsement of Thousand Flowers Approach
- Interregional Projects Require “Consent”
- Public Policy consideration
- Need for documentation of processes
Significance of What Was Not Decided:

• Conflict with Order 2003 Not Resolved
• Consent relationship to unilateral 205 filings
• Planning Parameters for Public Policy
• What constitutes J&R cost allocation within a region?
• Differing measures of “benefits” between regions
Overview of PJM Planning Reforms
Four Possible Approaches

• FYI Approach
• State Agreement Approach
• Critical Mass Approach
• Proactive Build Approach
• FYI Process
  – Perform extensive scenario planning analysis
  – Provide wide range of results to market – allow market to decide what resources and associated transmission should proceed to meet goals other than reliability
  – Results could include performance of various solution options, but no action would be taken by PJM
  – Provide for greater stakeholder interaction on front and back end
State Agreement Approach

- Allows one or more states to decide how to meet goals
- Integrate state selected projects into RTEP
- “Safe Harbor”---Agreeing states don’t pick up the tab for non-participant’s public policy needs
Critical Mass Approach

– Can be used to consolidate baseline reliability, market efficiency, and interconnection needs

– Commits to a project larger than needed for “bright line” drivers based on expectation that sufficient additional drivers exist and are likely to move forward

– Allows transmission projects for renewables, or other generation, to be included in RTEP when some percentage of associated generating capacity commits through an executed ISA or other trigger
“Critical Mass” Drivers

– Critical Mass projects can be based on:
  • Reliability drivers coupled with pending interconnection projects
  • At-risk generation
  • Pending interconnection projects, alone
  • State Agreement project drivers
  • Market Efficiency project drivers

– Would also integrate drivers from neighboring systems
  • Reliability criteria violations
  • Generation interconnection requests
Proactive Build Approach

– Design “Bright Line” triggers related to various policy initiatives
– PJM proactively orders transmission builds
– Triggers will represent fairly high hurdles for proactive action
POLICY CHOICES…

The Long and Winding Road…
• Transmission: Built to support major generation projects
• Connect distant generation to load; Distribution: One way delivery of power to the home
• Grid Costs: Rate-based to the home utility’s customers
• ROI: Little focus on transmission as a stand alone business element
Policy Choice #1

Is the grid an enabler or a competitor?

Grid as an Enabler?

– Accept the grid as a natural monopoly
– Drive solutions through regulation
– Provide incentives for innovation
Policy Choice #1 (cont’d)

Grid as a Competitor?

– Grid development must compete with generation or demand side
– Grid entrepreneurs take risk: no guaranteed ROI
– Grid pricing reflects competitive outcomes: Bid solutions into the marketplace (RPM)
Policy Choice #2: A Strong or Weak Grid?

Characteristics of the “Strong” Grid:

• Generation distance from load
• Meet the needs for future transmission expansion
• Costs socialized to reflect interconnected nature of the grid
• Broad regional approach
**Policy Choice #2** - The Alternative:

The localized grid…

- Generation closer to load
- Centralized focus on development of DSR, energy efficiency and renewables
- Transmission/distribution grid as an enabler of alternative generation
- Transmission focused on meeting state/local needs
Policy Choice #2: Decision Points

- Siting: Regional vs. Local Needs
- Cost Allocation: Socialization vs. Direct Assignment
- IRP/RPS vs. Competitive Procurement
- Short term procurement vs. long term
Policy Choice #3: Determine the Planning Philosophy

– Transmission decisions driven by generation investment or generation investment influenced by the planned transmission grid?

– Role of the Planning Authority
An Added Complication:

Who Decides?
Who Decides?

- States:
  - State Energy Policies: Governors/legislators
  - State PUCs
- FERC
  - FERC Review of Planning
    - Who chooses projects?
- Environmental Agencies
  - Non-attainment areas
  - RGGI et al.
“Hanging in mid-air”: a dangerous place
The Task Ahead: Blocking, Tackling & Teamwork!
LET’S TALK…

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Comparison of Existing Transmission Cost Allocation Methodologies for Development of Renewable Resources

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Background on Wind on the Wires

• **Organized** in 2001 to overcome the barriers to bringing wind power to market in the Midwest. WOW is the Midwest regional partner of the American Wind Energy Association (AWEA)

• **Work in 3 areas**: technical, regulatory/legislative, education/outreach
  – **Technical** – work with electric utilities and Midwest Independent System Operator (MISO – regional “grid” operator) on transmission planning for wind
  – **Regulatory/legislative** – actively promoting state and regional policies and decisions to advance wind power
  – **Education/outreach** – speak to many people and groups about our work and issues

• **Support** – Foundations and membership dues.

• **Members** – Wind developers, environmental and community energy advocates, goods & services providers.
Overview

1. Highway-Byway Approach -- Developed in SPP
2. Multi-Value Projects -- Developed by MISO
3. CREZ Program -- Developed by ERCOT
Which comes first: Renewable Generation or transmission to deliver it?

That's my little brother.
Road Block to Needed transmission development
“I Promise, it’s calculated by the bite”
You pay! NO you pay. No you!!!
The arguments can be serious to those involved . . .
Beneficiaries should pay!

• Trying to predict how much any particular entity benefits from particular upgrades is like......
A number of RTO’s have addressed the topic!
Design an infrastructure for current and future needs.
SPP and MISO

• SPP and MISO share common challenges and opportunities.
  – Both are rich in needed renewable resources.
  – Both require transmission enhancements to help address years of underinvestment and meet the needs of the footprint considering state and national policies in the 21st century.
  – Both need transmission planning and cost allocation that can encourage this needed transmission.
Highway-Byway Approach
Developed in SPP
Background: Development of Highway-Byway in SPP

• At the beginning of 2009 the SPP Board adopted and the Regional State Committee approved a plan for a new approach to transmission planning and funding.

• Proactive transmission planning would be done looking out over a twenty year horizon.

• This would be coupled with a simple and certain cost allocation design that will encourage construction of needed transmission – Highway-Byway
SPP View - Cost Allocation

• In SPP the scope for Cost Allocation is
  – To develop a robust regional transmission system large enough in both scale and geography to provide flexibility to meet SPP’s future needs (reliability, economic, and state policy)
SPP Cost Allocation

• In SPP the RSC’s Cost Allocation Working Group (CAWG) addressed issues common to any cost allocation methodology:
  – Voltage level break points for each cost allocation layer?
  – Who is charged?
  – How charges are made for each layer?
  – Whether existing transmission would be included in the new cost allocation design?
Design

- **PLANNING**: Integrated Transmission Planning Process will determine a regional plan for a transmission system that is built for the needs of the SPP footprint.

- **COST ALLOCATION**: Only applies to New Transmission and is placed into two layers
Cost Allocation for Highway-Byway

• Cost allocation approach applies to **new transmission only**.
  – It is expected new transmission will be planned and built for regional use
  – Does not include the existing system which was primarily built for local use.

• Has two layers of cost allocation
  – zonal and regional
  – no subregional layer.
**Highway-Byway in SPP**

- Highway includes 300 kV and above facilities
- Byway includes all facilities below 100 kV
- Facilities between 100 kV - 300 kV are split between highway and byway

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Paid for by Region</th>
<th>Paid for by Local Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 kV and above</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>above 100 kV and below 300 kV</td>
<td>33%</td>
<td>67%</td>
</tr>
<tr>
<td>100 kV and below</td>
<td>0%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Robust Plan 1

- Providing a Competitive Environment in SPP Markets
- Increasing System Reliability
- Preparing for Unexpected Shifts in Load
- Anticipating Import and Export Opportunities
- Broadening Resource Siting Options
- Valuing Cleaner Air
- Reducing Risk through Responsible Land Usage
- Increasing Efficiency with Reduced Transmission Losses

Source: 2010 Integrated Transmission Plan - 20 Year Assessment (6/30/2011)
What Highway-Byway is NOT!

• Generation Interconnection
  – Designated Hubs and Collector Systems
• A means to build transmission to serve other regions
• Future discussions
  – Entergy/MISO
  – Seams Discussions
Multi-Value Projects
Developed by MISO
Multi-Value Projects

Overview

• Multi Value Projects reflect the transformation of the MISO planning process by creating a regional network that, when combined with the existing system, provides value in excess of its costs under a variety of future policy and economic conditions.

• Fundamental Goal -- The development of a comprehensive expansion plan that meets reliability needs, policy needs, and economic needs.
  – SPP -- to provide flexibility to meet SPP’s future needs (reliability, economic, and state policy).
The Road to the First Multi Value Project Portfolio

Explorations of the policy, processes, and transmission solutions required to provide the best value for consumers began in 2003.
Multi Value Projects must meet one of three Tariff defined criterion

Criterion 1 -- Support Public Policy + Improve Reliability and/or Economic
A Multi Value Project must be developed through the transmission expansion planning process to enable the transmission system to deliver energy reliably and economically in support of documented energy policy mandates or laws enacted or adopted through state or federal legislation or regulatory requirement. These laws must directly or indirectly govern the minimum or maximum amount of energy that can be generated. The MVP must be shown to enable the transmission system to deliver such energy in a manner that is more reliable and/or more economic than it otherwise would be without the transmission upgrade.

Criterion 2 – Provide Economic Value in Multiple Pricing Zones + B/C > 1
A Multi Value Project must provide multiple types of economic value across multiple pricing zones with a Total MVP benefit to cost ratio of 1.0 or higher, where the total MVP benefit to cost ratio is described in Section II.C.7 of Attachment FF to the MISO Tariff. The reduction of production costs and the associated reduction of LMPs from a transmission congestion relief project are not additive and are considered a single type of economic value.

Criterion 3 – Provides Reliability + Economic benefits in large Area
A Multi Value Project must address at least one transmission issue associated with a projected violation of a NERC or Regional Entity standard and at least one economic based transmission issue that provides economic value across multiple pricing zones. The project must generate total financially quantifiable benefits, including quantifiable reliability benefits, in excess of the total project costs based on the definition of financial benefits and Project Costs provided in Section II.C.6 of Attachment FF.

* More information may be found https://www.midwestiso.org/Library/Tariff/Pages/Tariff.aspx
<table>
<thead>
<tr>
<th>Project</th>
<th>State</th>
<th>Voltage (kV)</th>
<th>In Service Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Big Stone–Brookings</td>
<td>SD</td>
<td>345</td>
<td>2017</td>
</tr>
<tr>
<td>2. Brookings, SD–SE Twin Cities</td>
<td>MN/SD</td>
<td>345</td>
<td>2015</td>
</tr>
<tr>
<td>6. Ellendale–Big Stone</td>
<td>ND/SD</td>
<td>345</td>
<td>2019</td>
</tr>
<tr>
<td>7. Adair–Ottumwa</td>
<td>IA/MO</td>
<td>345</td>
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</tr>
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<td>MI</td>
<td>345</td>
<td>2015</td>
</tr>
<tr>
<td>14. New Reynolds–Greentown</td>
<td>IN</td>
<td>765</td>
<td>2018</td>
</tr>
<tr>
<td>15. Pleasant Prairie–Zion Energy Center</td>
<td>WI/IL</td>
<td>345</td>
<td>2014</td>
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<td>16. Fargo–Oak Grove</td>
<td>IL</td>
<td>345</td>
<td>2018</td>
</tr>
<tr>
<td>17. Sidney–Rising</td>
<td>IL</td>
<td>345</td>
<td>2017</td>
</tr>
</tbody>
</table>
... and their Development
B/C Analysis of MVPs in MTEP11

MVPs create a variety of economic benefits

Benefit by Value Driver
(20 to 40 year present values, in 2011$ Million)

$12,404-$40,949
$1,023-$5,093
$111-$396
$1,354-$2,503
$226-794
$15,540-$40,204
$8,789-$16,407
$6,750-$32,797

Increased Market Efficiency
Deferred Generation Investment
Other Capital Benefits

wind on the wires
Bringing Wind Power to Market
CREZ Program Developed by ERCOT
CREZ Background

- CREZ – Competitive Renewable Energy Zones; areas with optimal conditions for the economic development of wind power
- CREZ is part of Texas renewable energy program
- Texas PUC directed to create zones and designate transmission lines to transmit the power to highly populated areas of state.
- Potentially transmit 18,500 MW of wind power

(CREZ Progress Report No. 5 (Oct. 2011))
Thank you

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Public Policy Transmission

Competition and Cooperation

Paul J. Hibbard

Energy Bar Association
November, 2011
Renewables for Public Policy:

Incentives: Government keeps upping the ante

- Increasing renewable portfolio standards
- Aggressive NAAQS and water regulations
- Climate compacts, state GHG goals and standards
- Continued (if weak) discussion of federal standards
- Transmission policies (Order 1000, NIETC discussions)

Challenges: physical characteristics, economics, jurisdiction

- Resources distant from load
- Variability an operational challenge
- Cost environment not great
- Jurisdiction over siting
- Jurisdiction over resource planning
- Benefit calculation and cost assignment
Biggest Challenges – Identifying Benefits/iciaries for Public Policy Projects

**FERC**

- Consider public policy (up to states?) in transmission planning
- Develop cost allocation method for public policy projects
  - Ideally, figure out way to determine benefits, based on production costs
- FERC will step in based on record where regions fail to act

**Key challenges**

- What is a public policy that requires transmission?
  - And what if states don’t agree
- How does one calculate benefits

*We went through exactly this in New England in 2008*
But, transmission is an issue for wind (not gas)
Market Context

Energy, capacity, reserves, ancillary services, transmission rights

Financial signals for development stem from

- Long-term capacity market signal (in strong revision)
- Shorter-term energy, reserve, ancillary market revenues
- Transmission right revenues for new transmission development
- Emission markets (making fossil generation less competitive)
- RECs (making renewables more competitive)

Demand response and energy efficiency a key player in capacity, energy markets (approaching 10% of market need)

Renewables development booming

Robust competition, major transmission investment
Transmission Development in the Market Context

Reliability
- ISO identifies reliability needs, “backstop” transmission solution
- Market can identify non-transmission solution (local generation, demand response, merchant transmission etc.)
  - Current efforts to better align the two …
- Absent market response, “backstop” transmission pursued
- Costs socialized

Generation Interconnection
- Viewed as a development cost (resource-neutral)
- Level playing field for all generation options competing to meet need at lowest delivered price of electricity
- Includes interconnection, any needed system reliability upgrades
  - (i.e., generator must be able to connect, and to do so without diminishing existing level of system reliability)
- Developer pays – RESOURCES COMPETE ON DELIVERED PRICE BASIS
Challenges

Developers said states “needed” renewables due to RPS, states did not agree

- Policymakers set the standards (RPS with alternative compliance cost “cap” – does not require steel in ground)
- Let competitive markets produce the lowest-cost compliance path
- Based on delivered price to retail customers

Benefits calculated on production cost basis

- The “but for” scenario would produce identical costs to consumers, but not producers
- Difficult for states to agree on allocation in this context

Analogy: identical prices on gallons of milk at grocery store

- But charged extra at register for one that came from further away
Result

Process abandoned

States engaged in cooperative discussion

Considered solution supported by Governors

- Coordinated procurement/long-term contract options
- Coordinated siting for transmission
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