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Session 4A—Toward Responsible Small Hydro Development

"Developing new hydro in open waterways and conduits"

NHA Annual Conference 2010

April 26-28, 2010

Washington, DC

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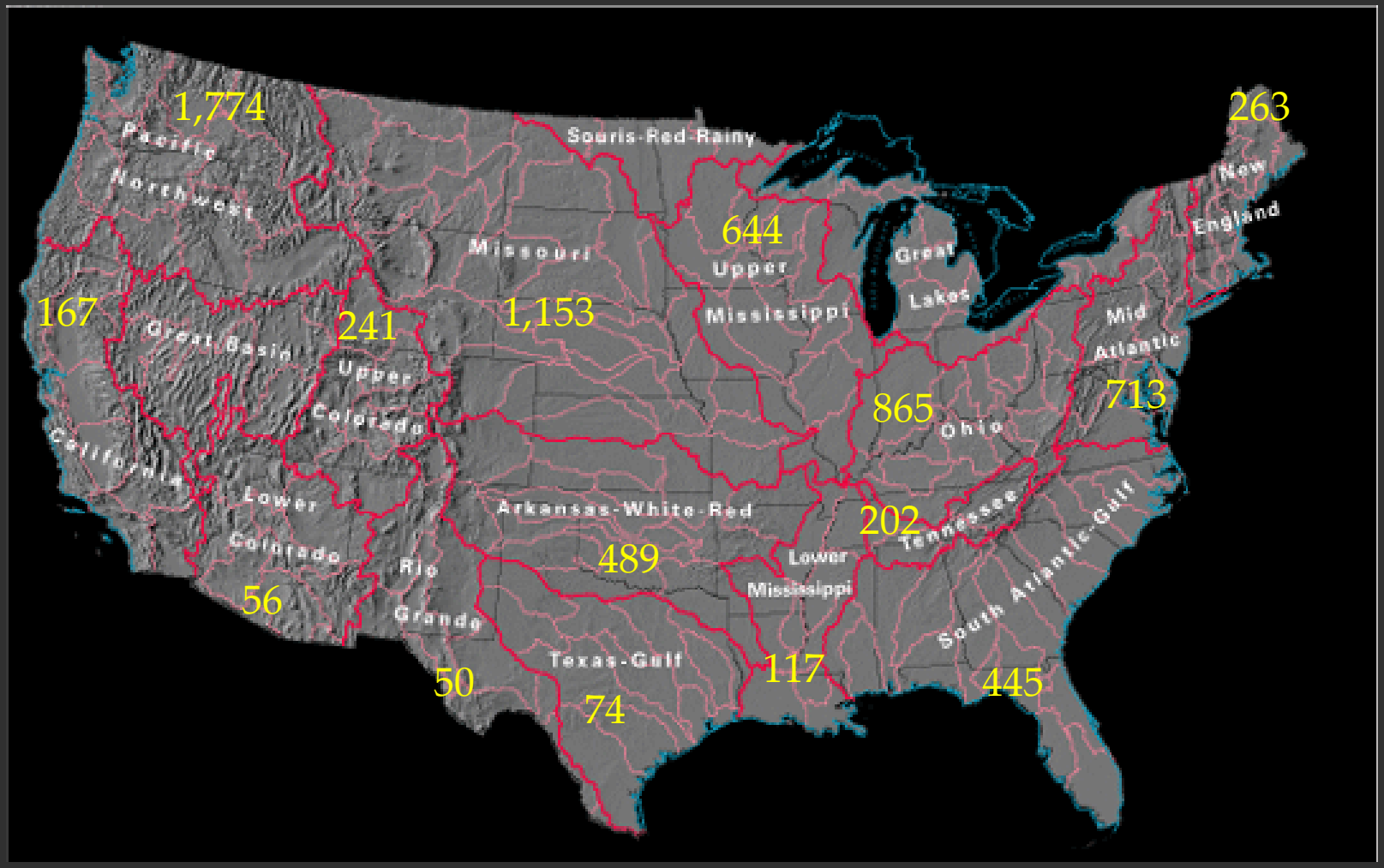
Significant conduit potential compared to in-stream low head



California Navigant study concluded **255 MW** of in-conduit potential in CA that is not reflected in any of the DOE resource assessments

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Benefits of constructed waterway sites

- Minimal environmental impacts of development
  - Existing infrastructure
  - Responsible site selection is still important to identify sites that are close to roads and transmission lines, minimizing those additional impacts
- Multiple benefits of development
  - Improved canal infrastructure
  - Increased water conservation / water efficiency
  - New, renewable, reliable electricity generation
- Each individual installation may be smaller, but developing multiple sites can yield significant aggregate potential

Challenges

- Technology challenge
  - Scale from small to large water flows (20 to 1,000's cfs) where head is constrained between 5 and 30 feet
  - Deliver high performance as flow chokes off at a given installation (ie, as flat and as high a part-flow efficiency curve as possible)
- Standardize as many aspects of installation as possible
  - Bring down cost of turbine and cost of installation
- Interconnection
  - Site selection is key to minimize costs

Example project in the Northwest

- Head: 20 ft
- Flow:
  - 150 days flow at 400 cfs
  - 50 days flow at 250 cfs
- Estimated installed capacity: 400 kW
- Estimated capacity factor: 56%
- Estimated generation: 1,940 MWh annually
- Site is right next to a distribution line
- District has 400+ miles of canals with drops such as this one

Pilot Plant: Buckeye, AZ

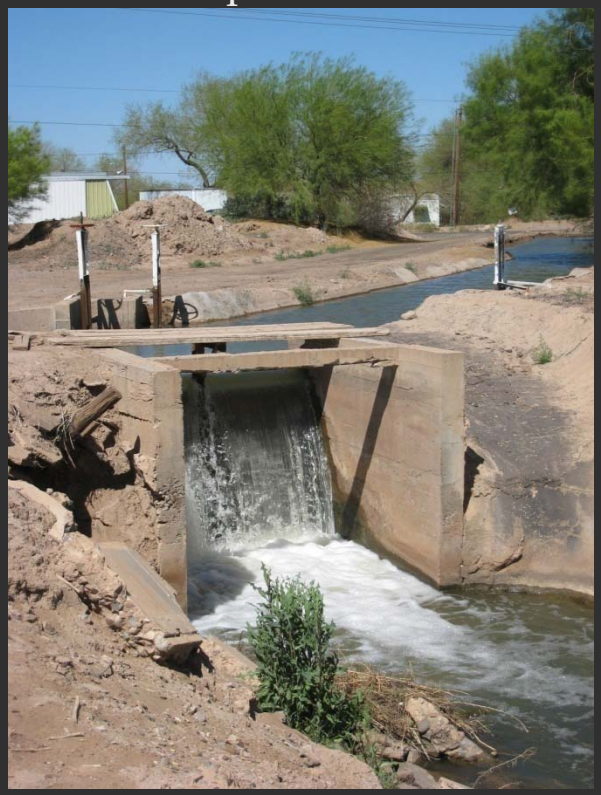
Irrigation drop owned by Buckeye Water Conservation & Drainage District.

Power from existing infrastructure will offset pumping costs and generate revenue.

Project is using an SLH-10 unit, with a rating of 25 kW at 4 m head.

From left, Abe Schneider, Ed Gerak (District General Manager), Joe Blankenship and Ken Saline standing downstream of site

The old South Extension drop structure



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Pilot Plant: Buckeye, AZ, continued

December 2008: Buckeye completed work on drop and canal. Project required an "exemption from licensing" from FERC before the SLH unit can connect to the grid.

April 19, 2009: Public comment period closed with no comments raised.

September 2, 2009: Letter granting FERC Exemption issued

December 2009: SLH engine installed

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Water back on: December 12, 2009

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Running in off-grid mode prior to grid-connection

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Security fence installed around powerhouse

Installation of the pole and transformer

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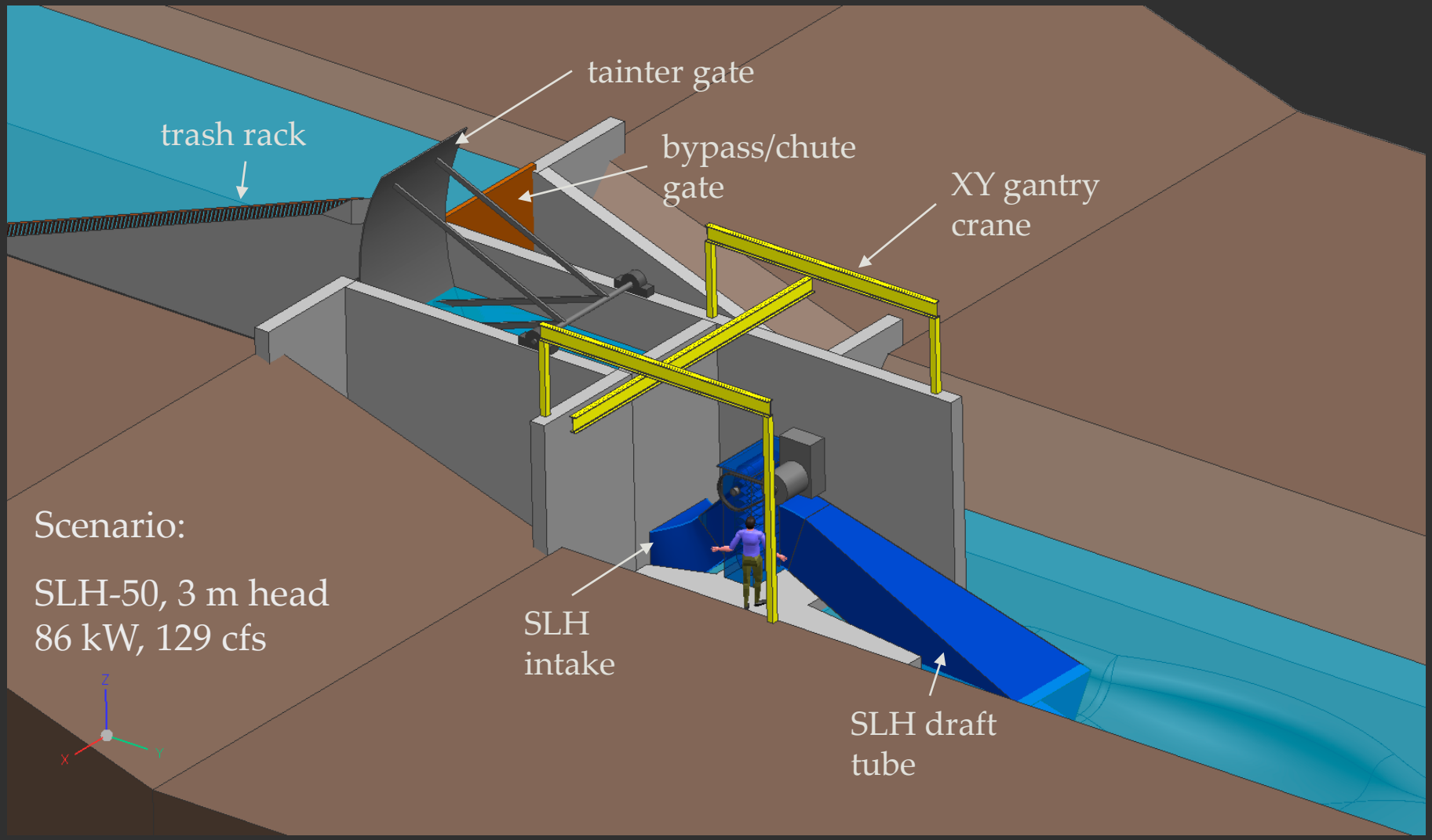
Example: In-canal civil layout



This is an example configuration of installation of an SLH in a canal

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Thank You

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Head still matters…

	Size 1		Size 2		Size 3		Size 4		Size 5	
design head	power	flow	power	flow	power	flow	power	flow	power	flow
ft	kW	cfs	kW	cfs	kW	cfs	kW	cfs	kW	cfs
5	6	19	25	80	50	159	100	318	250	795
10	17	26	71	112	141	225	283	450	706	1,124
20	47	37	200	159	400	318	799	636	1,998	1,590
30	86	45	367	195	734	389	1,468	779	3,671	1,947

Head in feet
Flow in cubic feet per second