Governor Fallin's Produced Water Working Group Initiative

Western State Engineers

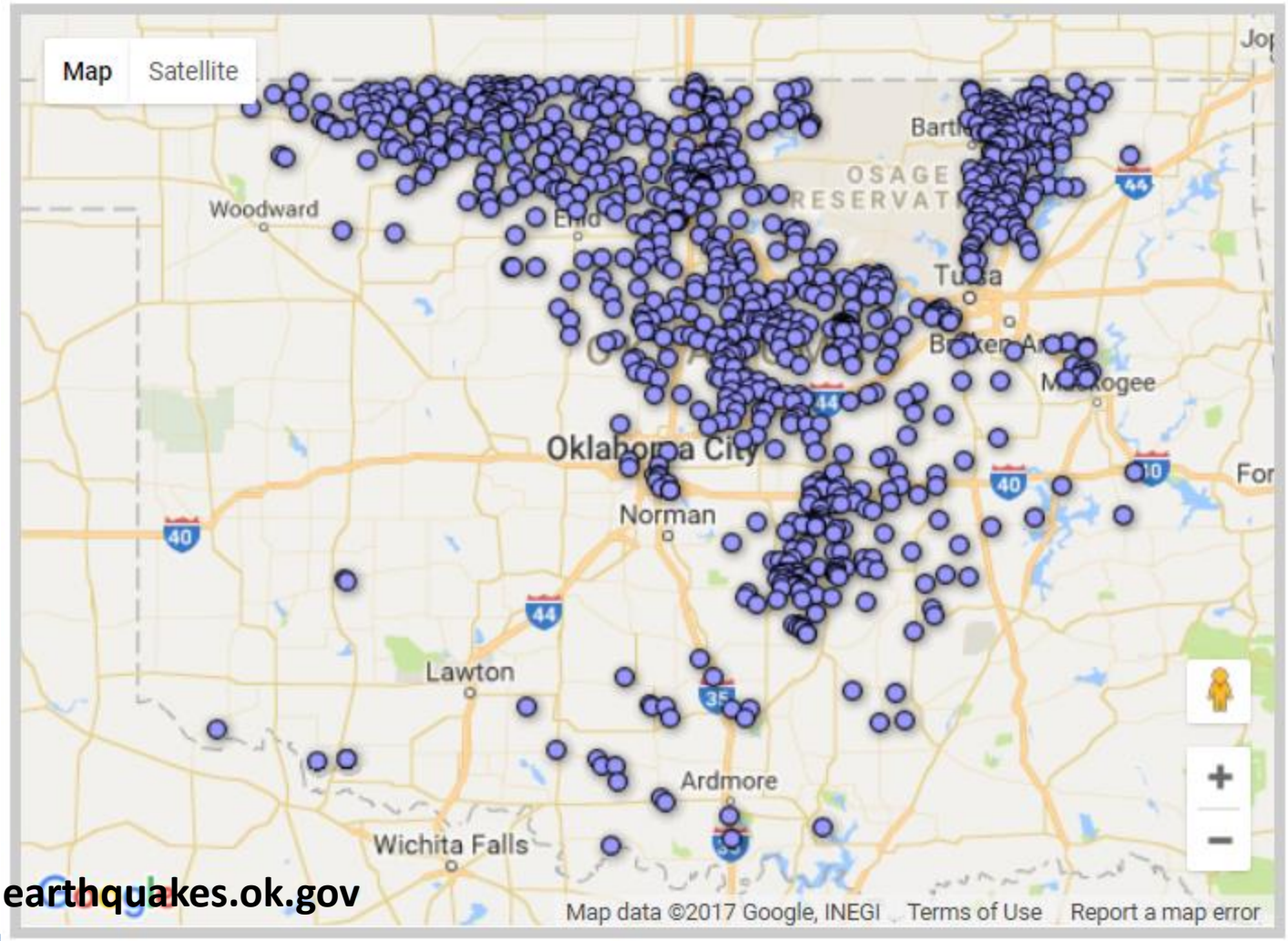
June 2018

Owen Mills

Director of Water Planning

OWRB
the water agency

Earthquake Map – SWD Wells

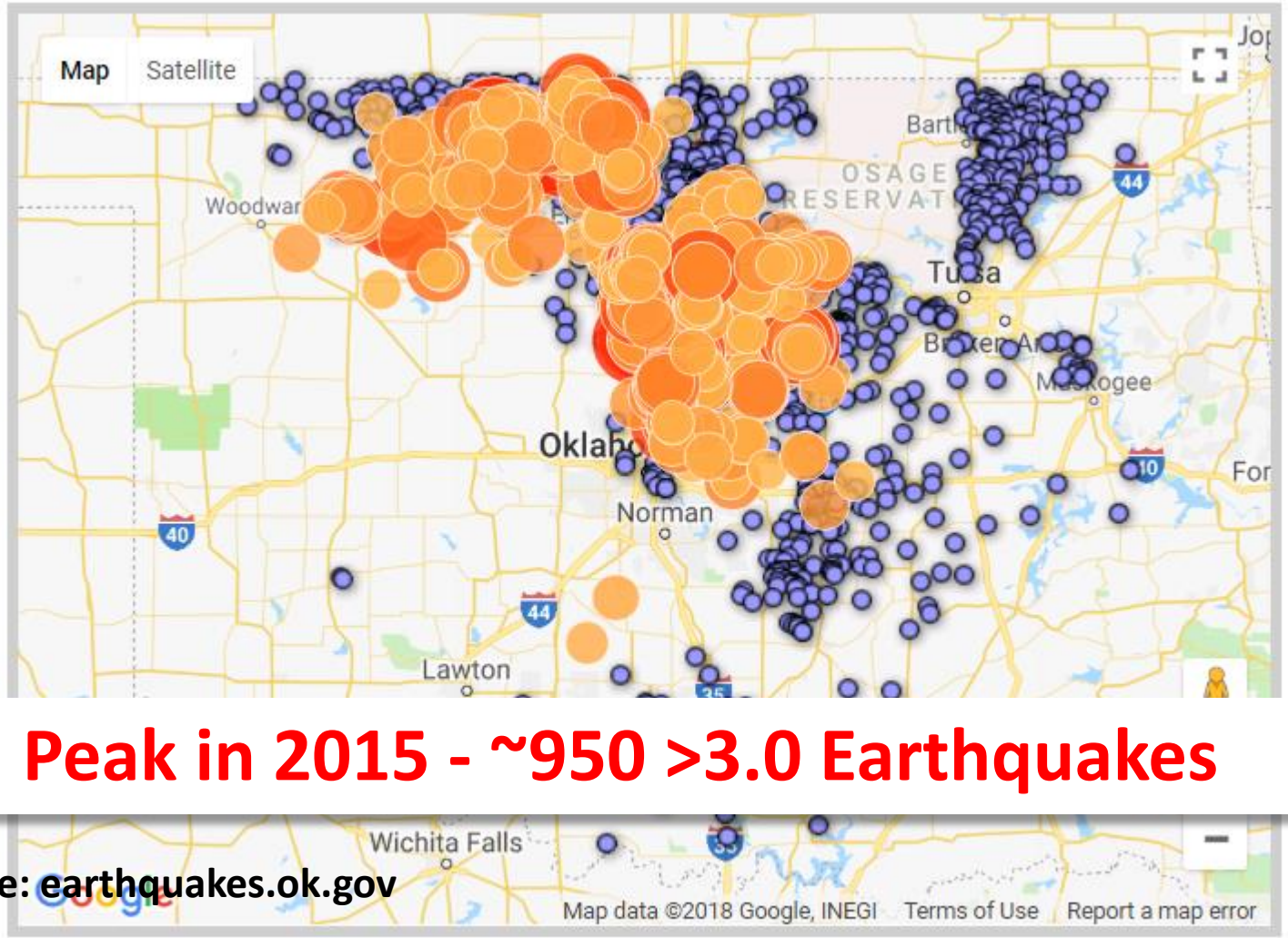


Source: earthquakes.ok.gov

Note: Only Earthquakes with a magnitude of 3.0 and higher are displayed.

☐ Earthquakes - Past 7 days ☐ Earthquakes - 2012 ☑ Arbuckle Waste Water Disposal Wells

Earthquake Map – SWD Wells



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Peak in 2015 - ~950 >3.0 Earthquakes

Source: earthquakes.ok.gov

VRB the water agency

Water for 2060
Produced Water Working Group

- Non-regulatory work group
- Gov. Fallin named OWRB to chair
- Win-Win by conserving fresh water and reducing seismic activity.
- 2060 Advisory Council recommended MQW for energy and industry.

PW Working Group
** In a Nutshell **

- 17 Members from Industry, Regulators, NGO's, Municipal, Academia,
- 2017 Hi-Level Pilot Study – Assess Options
- 2018 – Phase 2 – USBR Feasibility Study on Phase 1 findings

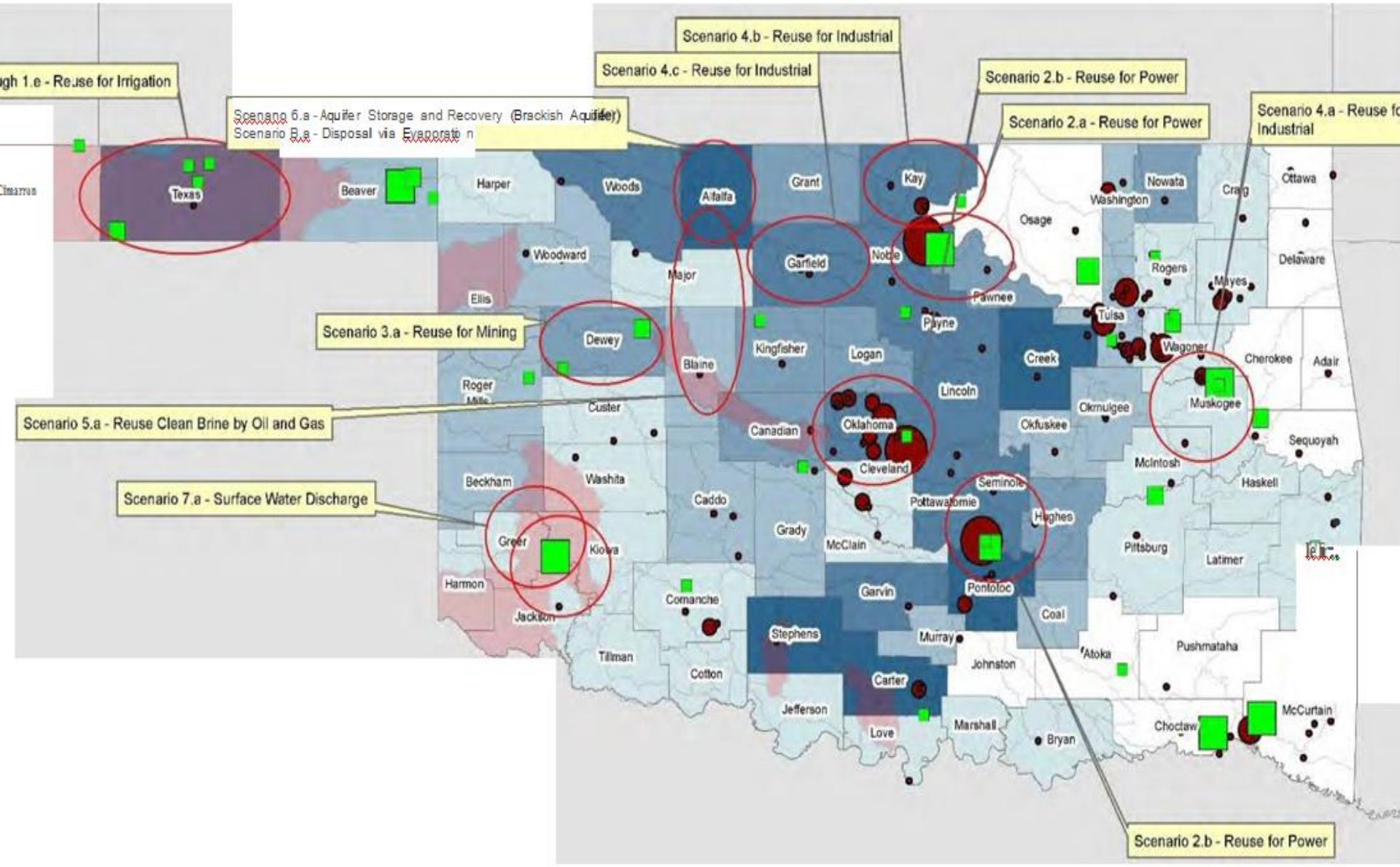
Regulatory and Legal Challenges

- State High bonding $$ for Pits etc.
- NPDES discharge – barriers and timing
- PW ownership – “taking” issues
- Cooperative water/infrastructure liability
- Right-of-way and landowner negotiations

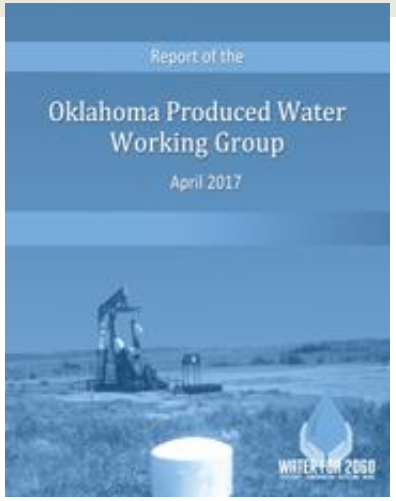
Subcommittees – 4 Topics

- Agriculture
- Regulatory and Legal Issues
- Oil and Gas Industry
- Industry/Municipal - Discharges

Preliminary Matches and Scenarios

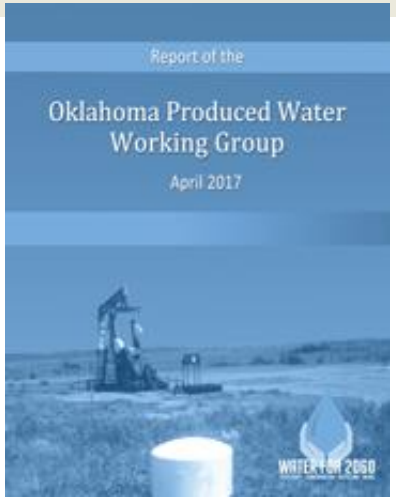


Pilot Study on Reuse



- High level statewide look
- Spatial db of Supply/Demand
- Treatment cost estimates
- Economic scenarios

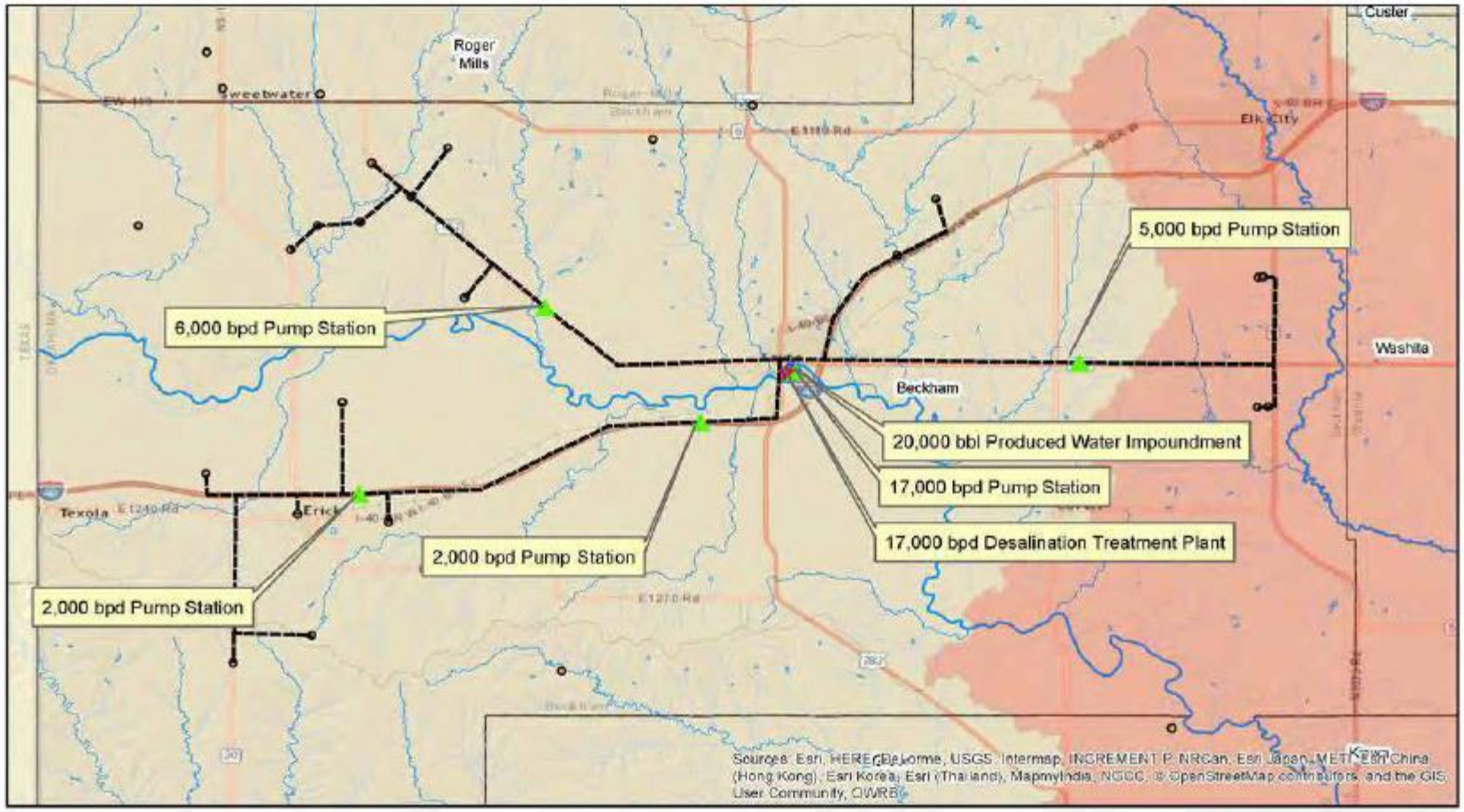
Pilot Study Scenarios



Scenarios vs. Disposal

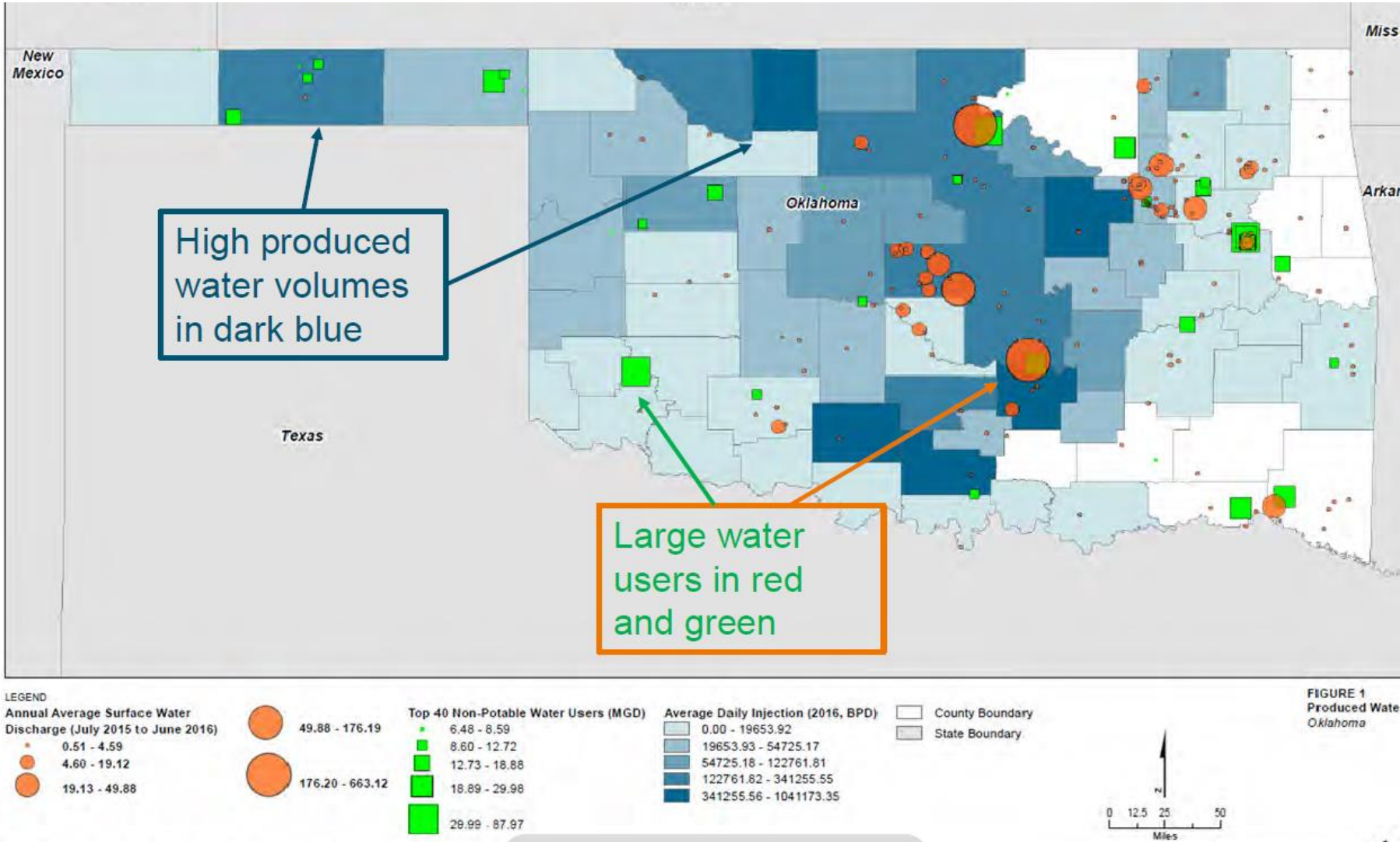
- Clean brine transfer and treatment (O&G)
- Evaporation
- Desalination

Clean Brine Transfer



Evaporation

Desalination:
PW Supply and Industrial Demand



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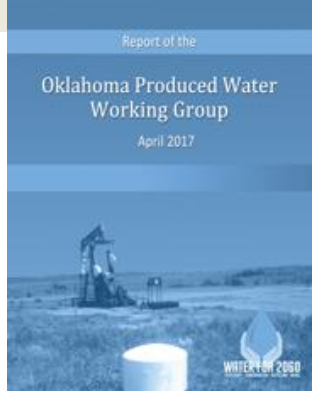
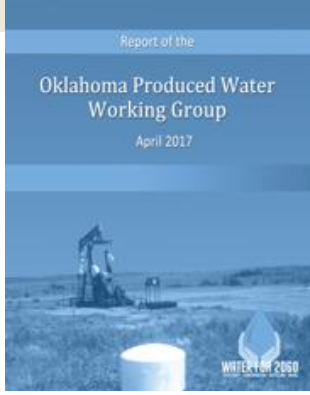


Scenarios Compared to Source Water and Disposal

- Clean brine (O&G) transfer and treatment
- Evaporation
- Desalination

New Case	Case Description	Total Capital ($Millions)	Capacity BWPD	County	Assumed Wtr TDS (mg/L)	Normalized $/BW
1	Typical Source and Dispose - STACK & SCOOP	NA	NA	Central OK	NA	1.09
2	**Oil and gas re-use (treatment cost only)**	**NA**	**NA**	**State-wide**	**NA**	**0.57**
3	Clean Brine Transfer & treatment	208	200,000	Alfalfa	213,000	1.03
4	Evaporation - low TDS (SCOOP & STACK)	NA	20,000+	Blaine	17,000	1.66
5	Evaporation - high TDS (Miss. Lime)	NA	20,000+	Alfalfa	213,000	1.79
6	Desalination for Surface Discharge	22	15,000	Beckham	9,000	3.58
7	Desalination for Power Use	88	130,000	Pawnee	125,000	4.37
8	Desalination for Power Use	95	230,000	Seminole	180,000	4.43
9	Desalination for Industrial Use	35	30,000	Grant	227,000	7.41
10	Desalination for Surface Discharge	38	30,000	Grant	227,000	7.49

Pilot Study on Reuse



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PWWG Feasibility Study

Further investigate:

- Water transfer of Miss. Lime to STACK
- Evaporation technologies
- Environmental and Stakeholder impacts

Partners: GWPC, EDF, UT-BEG

USBR WaterSMART grant

Questions?

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the water agency

Subcommittees - Agriculture

- Large volume in specific widespread areas
- Seasonality an issue for treatment plant
- Chemical Spray is good but limited volume
- Hay irrigation widespread and intermittent

Subcommittees – O&G Industry

Oil and Gas

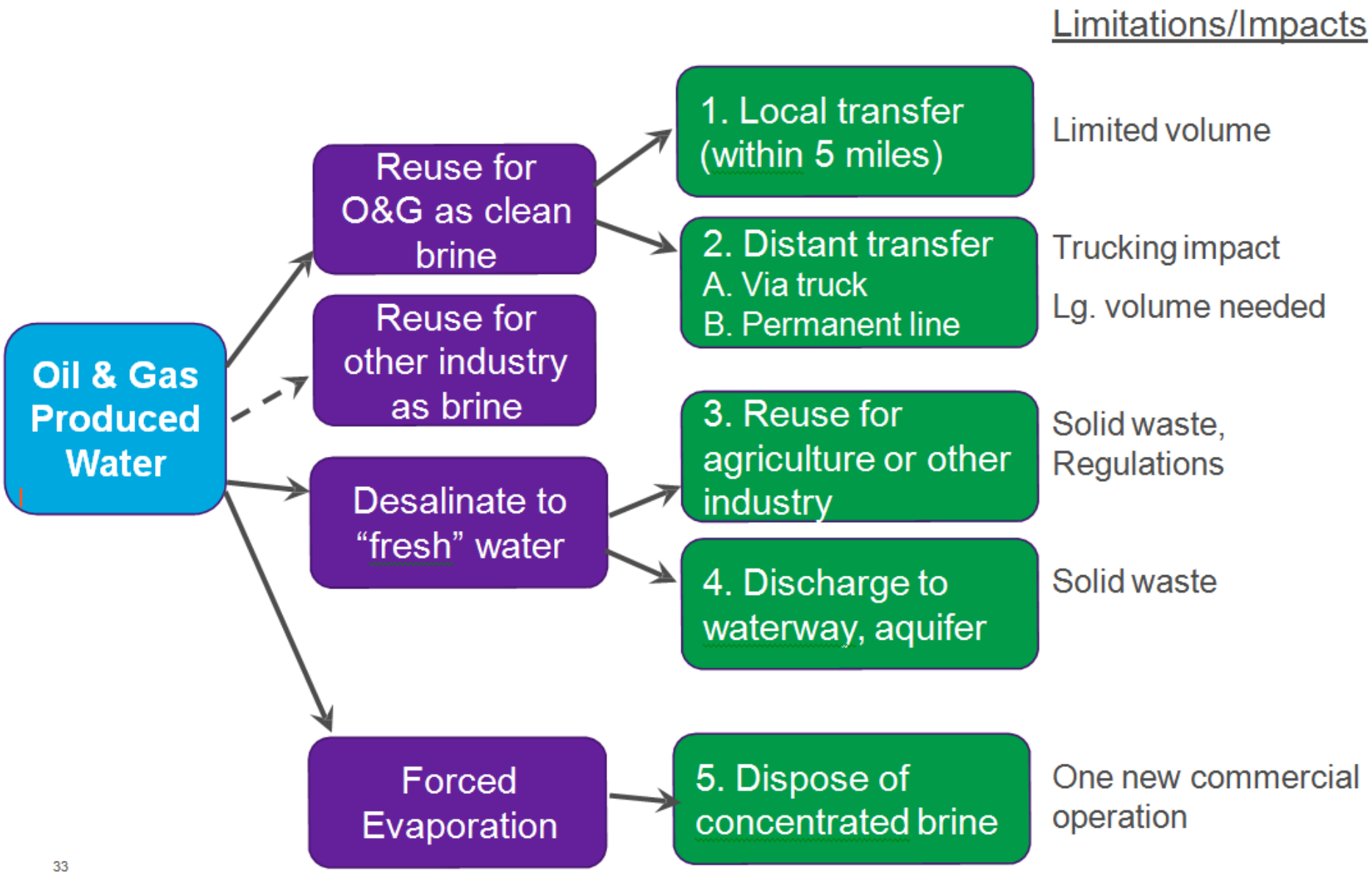
- Re-use requires minimal treatment and is best option but demand << supply
- Incentives coupled with disincentives needed?
- Moving target, Valid economic comparison of scenarios is very difficult.

Subcommittees – Industry/Municipal

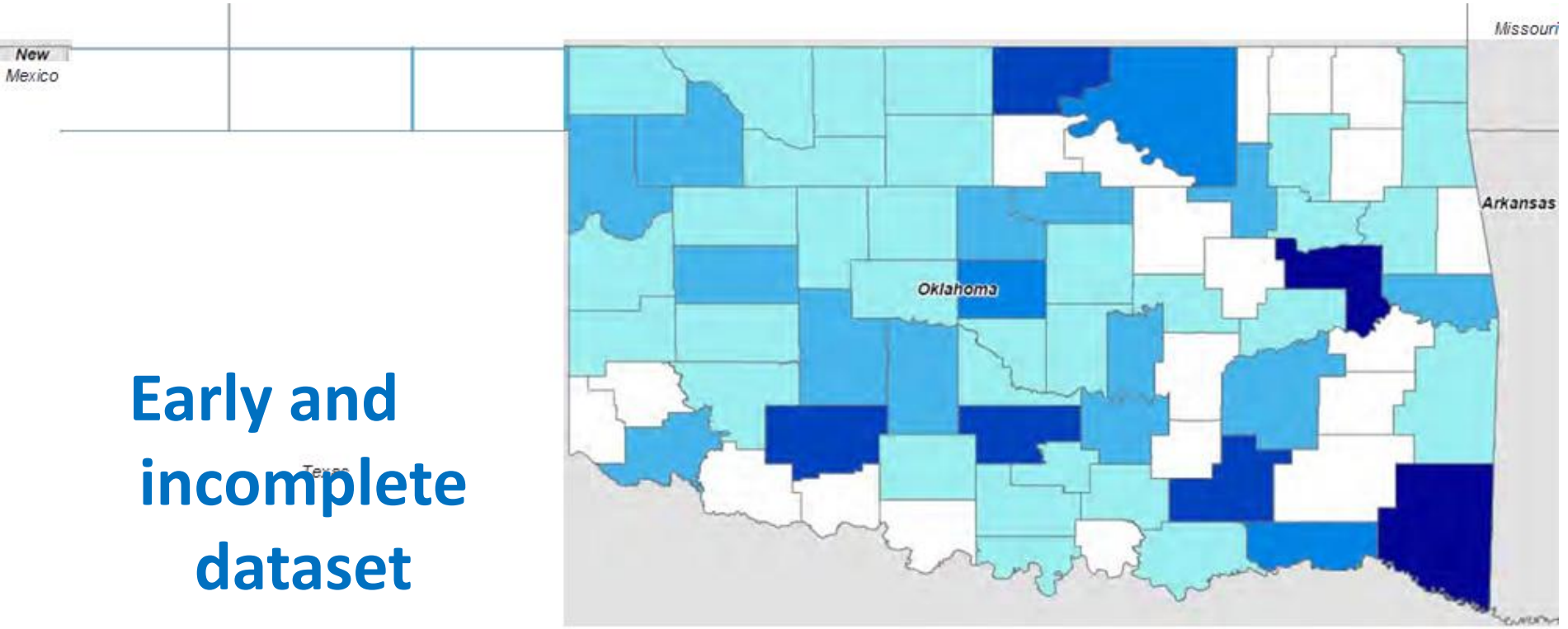
Potential uses

- Power needs dependable cooling water
- Municipal – non-potable uses?
- Direct discharge to a stream – timing – EPA okay
- Aquifer Storage and Recovery – likely MQ aquifers.

Study – Options for Reuse

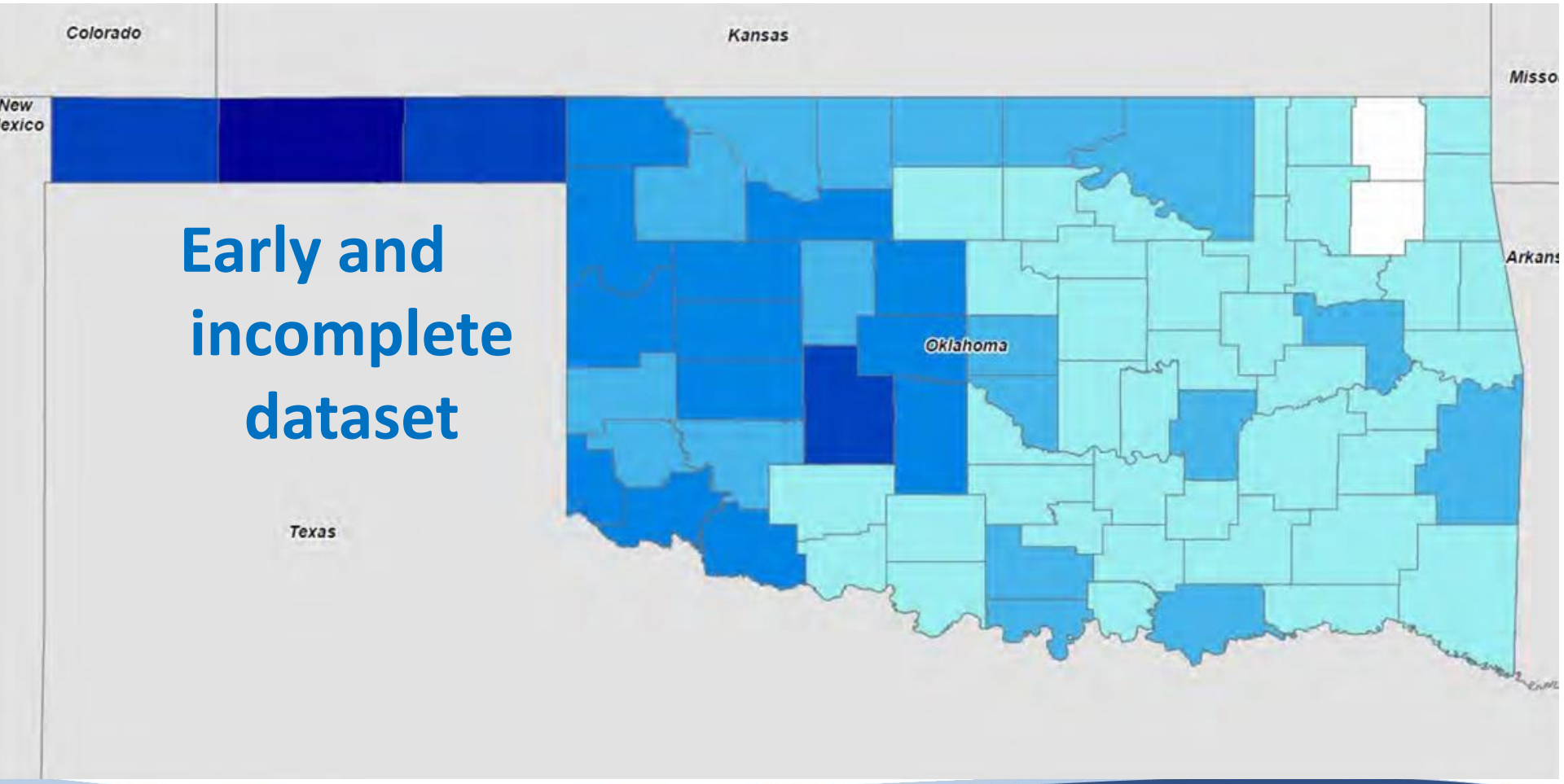


Industrial Water Use by County



Early and incomplete dataset

Irrigation Water Use by County



Economic Proposition

Disposal Costs Savings

+

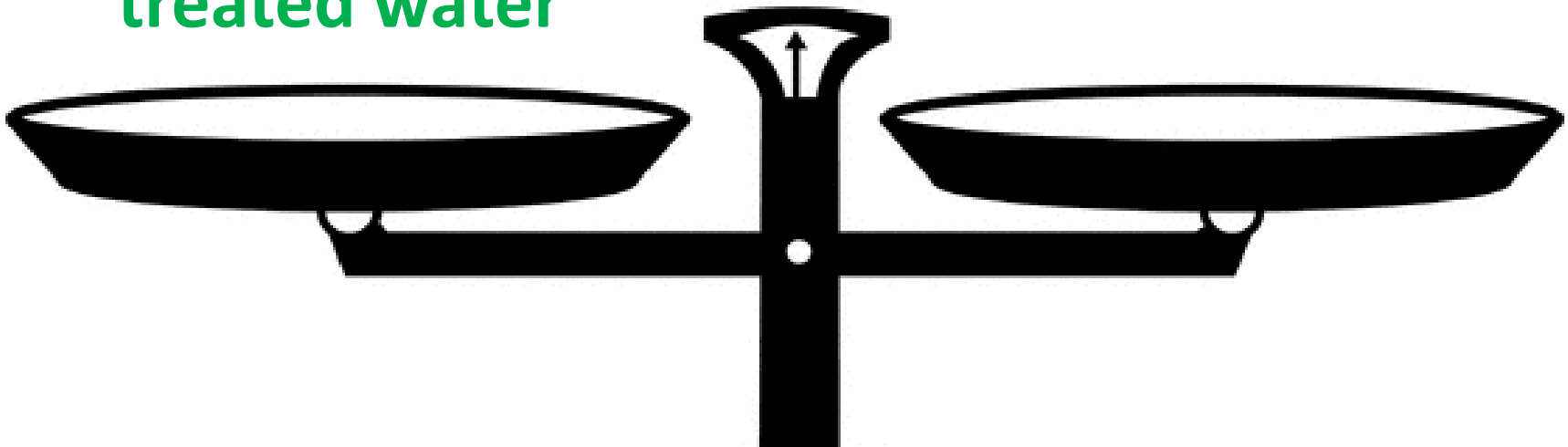
Value of treated water

Offset?

PW Transport

+

Treatment /Disposal



Produced Water Working Group

- Members of multiple sectors – industry, NGO, regulatory
- Pilot PW Study -
  - Matches PW volumes with potential end users
  - Defines economically viable technologies
  - Determines transportation network challenges
  - Identifies needs for regulatory changes
  - Recommendations moving forward
- Legislation
  - for state delegation to permit PW discharges
  - ownership issues? Who gets revenue for water, et al?

Produced Water Working Group

Findings and Next Steps for Feasibility:

- Economic Recycling feasibility within the industry
  (STACK Play: 15,000 wells * 67 AF/ well = >1,000,000 AF)
  - Piping it to new jobs
  - Clean Brine for use
  - Regulatory needs

- Evaporation Technologies
  - Safety/environmental concerns
  - Economically feasible

Next Steps and Timing

- Data -Water Quality
- Data -Water Treatment costs
- Develop cost estimates for economic scenarios including infrastructure
- PWWG Recommendations for statutes, rulemaking, permit delegations, etc.