

Regional Energy-Water Resilience Under Climate Change

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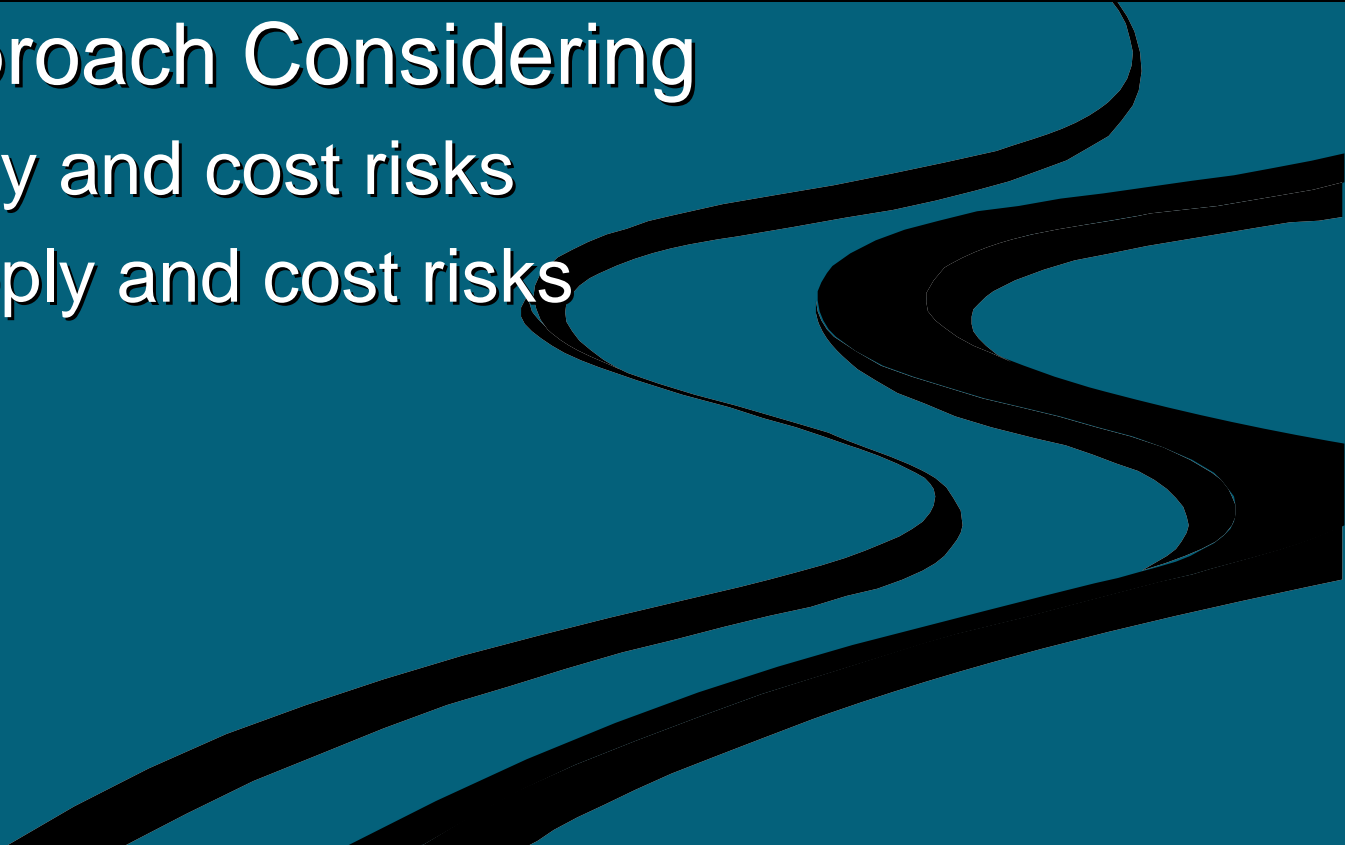


The William and Flora
**HEWLETT
FOUNDATION**




Kinship Conservation


Transactions of The Future

- Integrate Water and Energy Considerations
 - Coordinated by Regional Institutions
 - Portfolio Approach Considering
 - Water supply and cost risks
 - Energy supply and cost risks
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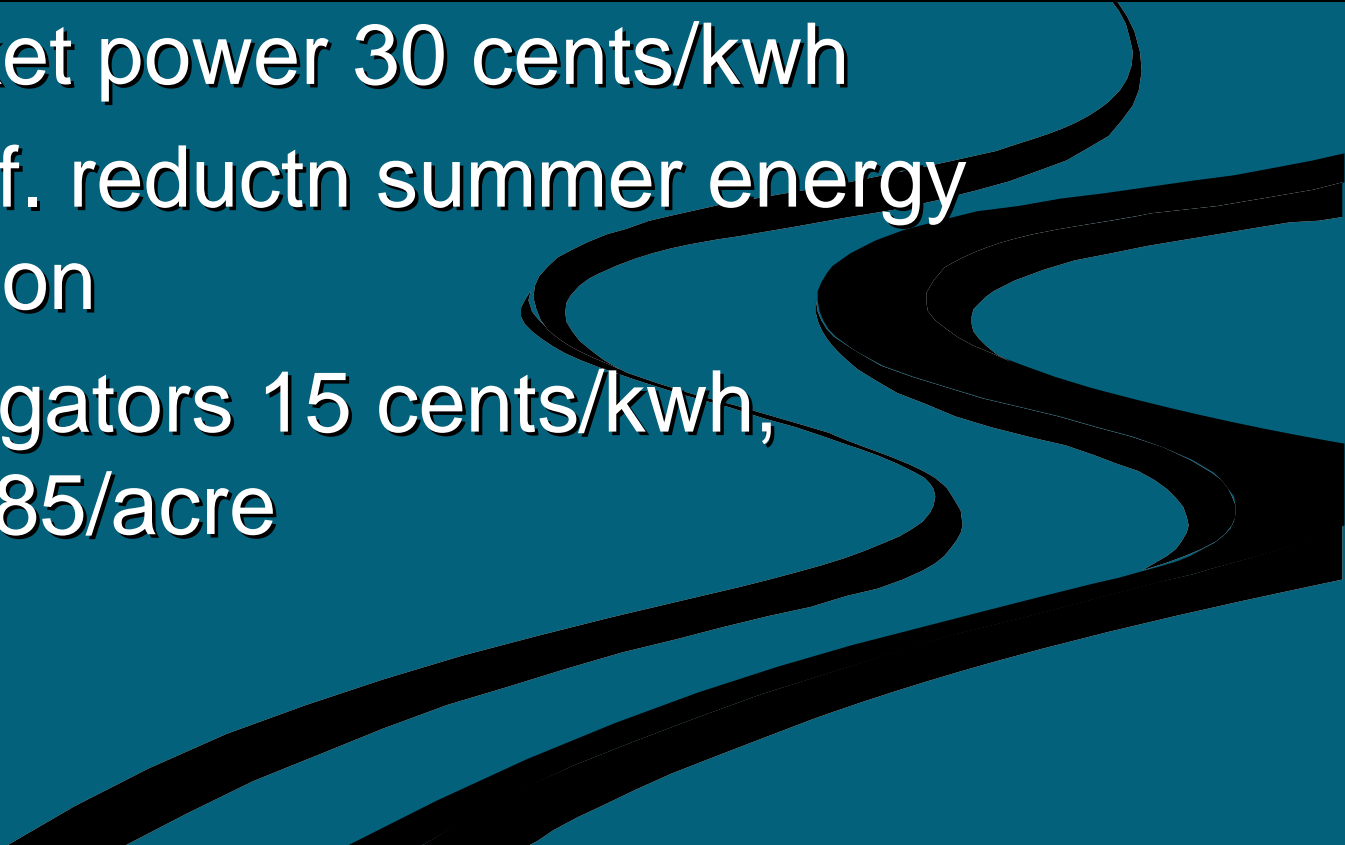
Regionally Resilient Water & Energy Management

- offers mix of portfolios for differing reliability needs & ability to pay
 - urban indoor and outdoor use
 - vineyards and wheat fields
 - ESA flows and kayaking flows
 - power plants, mines, breweries
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Regionally Resilient Water & Energy Management

- offers mix of portfolios for differing risk-reliability needs & ability to pay
 - “nimble”, timely response to changing conditions
- 

Pacific northwest water- power transactions

- 2001, severe regional drought
 - need water for hydro and fish flows
 - Spot market power 30 cents/kwh
 - goal: signif. reductn summer energy consumption
 - offered irrigators 15 cents/kwh, approx \$485/acre
- 

- In 2 weeks, forbearance contracts for 409M kwh, forego irrigating 136K acres
- penalty: 30 cents/kwh if power use not reduced per contract
(irrig. prices = 3 cents/kwh)
- cut summer irrig. electricity demand 25%
- similar deals with large industrial plants

- program cost 15 cents per kWh, big savings in April-May when market at 30 cents/kwh
- BUT crisis passed, electricity prices back to typical 3 cents/kwh by June.
- IPC customers still had to pay for program
- Intended to be a cost-savings hedge, but proved costly and unnecessary

What can we learn?

- agreement did not allow modification as conditions changed
- negotiated in midst of crisis
- craft contingency agreements in advance of crisis, need adequate review of terms

What else can we learn?

- agreement quickly achievable with \$\$\$
- agreement crafted in kwh not acre-feet
- set up payment scale to attract preferred locations and participants: one third of enrolled acreage provided minimal benefits (too far downstream)

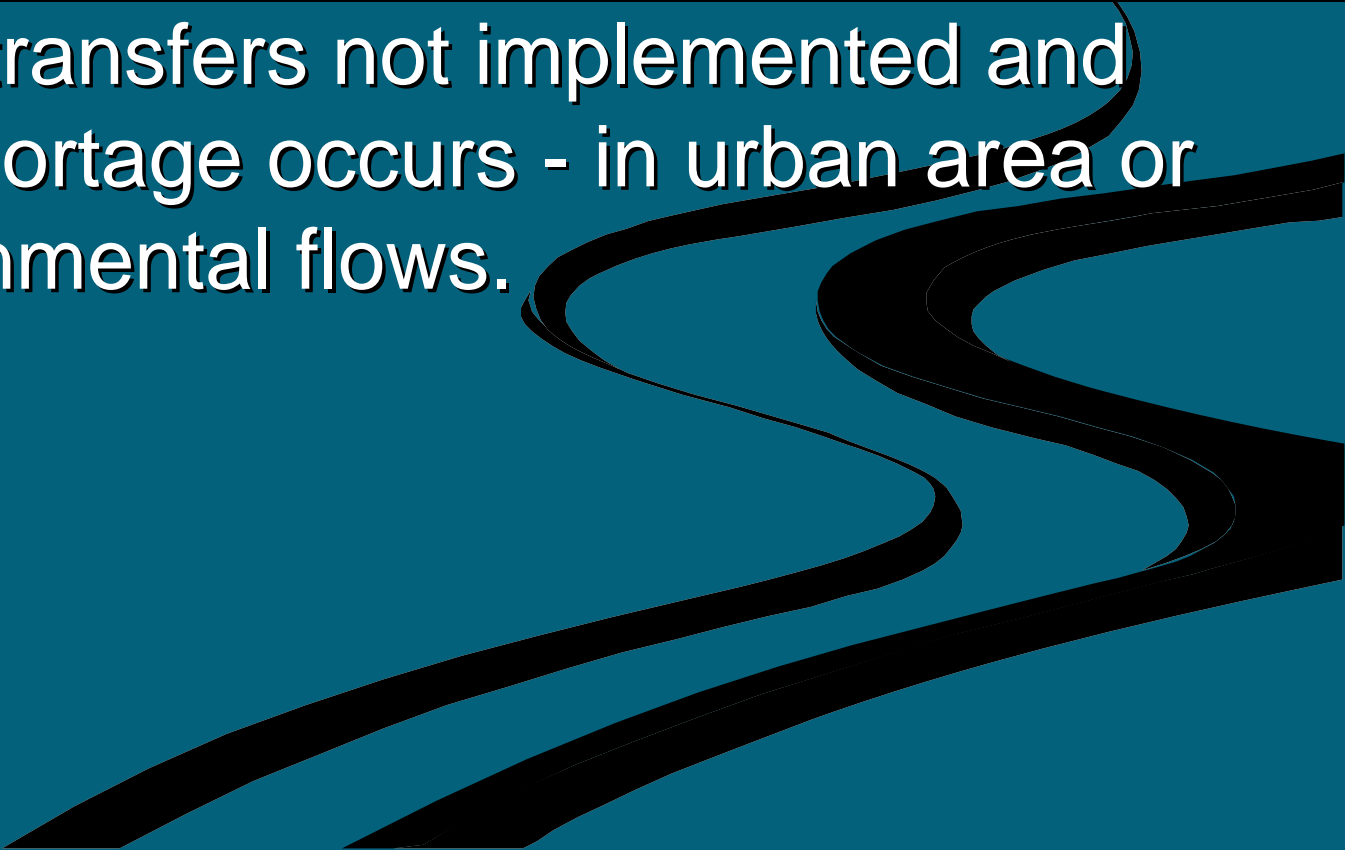
Perils of Contingency Agreements

Type I Error

FALSE ALARM – temporary water-power transfers implemented then not needed ...
late spring storms or cool, wet summer

Type II Error

Contingent transfers not implemented and serious shortage occurs - in urban area or for environmental flows.

The background of the slide features a dark teal color. In the lower right quadrant, there are several thick, black, wavy lines that curve and flow from the bottom right towards the center, creating a sense of movement or a stylized landscape element.

Actual Condition

Shortage

No Shortage

Contingent
Transfer:

Activated

Shortage
Mitigated

Type I
Error

Not
Activated

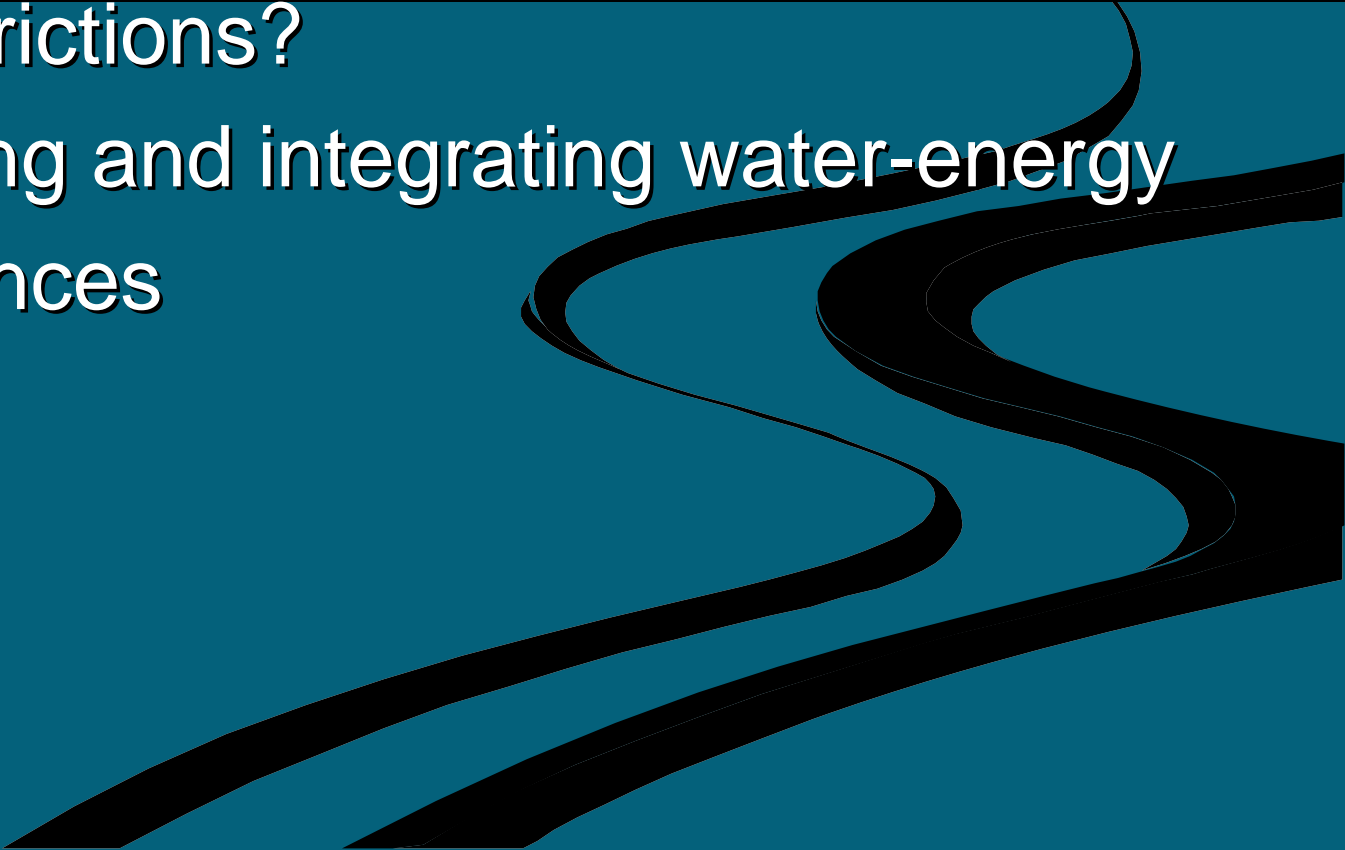
Type II Error

No problem

Type I Errors (False Alarms) result in unnecessary water-power acquisition costs, unnecessary disruption of crop production

Type II Errors result in water shortage costs which could have been mitigated

What Do We Need to Get Better At Contingency Agreements?

- Ag crop cycles, seasonality, costs
 - Urban areas: what's it really worth to avoid water restrictions?
 - Considering and integrating water-energy consequences
- 

Ag Production Cycle, Costs

- Cotton, S Cal, western Az
- Approx 3.5 afcu/acre
- Approx \$1,200/acre variable costs
- Dec-Mar, \$150/acre expended pre-planting
- April – May, \$150/acre + water
- June, \$150/acre + signif water
- July, another \$300/acre + signif water
- Sept, harvest cotton

What Do We Need to Get Better At Contingency Agreements?

- Ag crop cycles, seasonality, costs, returns
- Urban areas: what's it really worth to avoid water restrictions



Urban WTP “down under” cricket match in the dirt



Urban WTP “down under” cricket match in the dirt



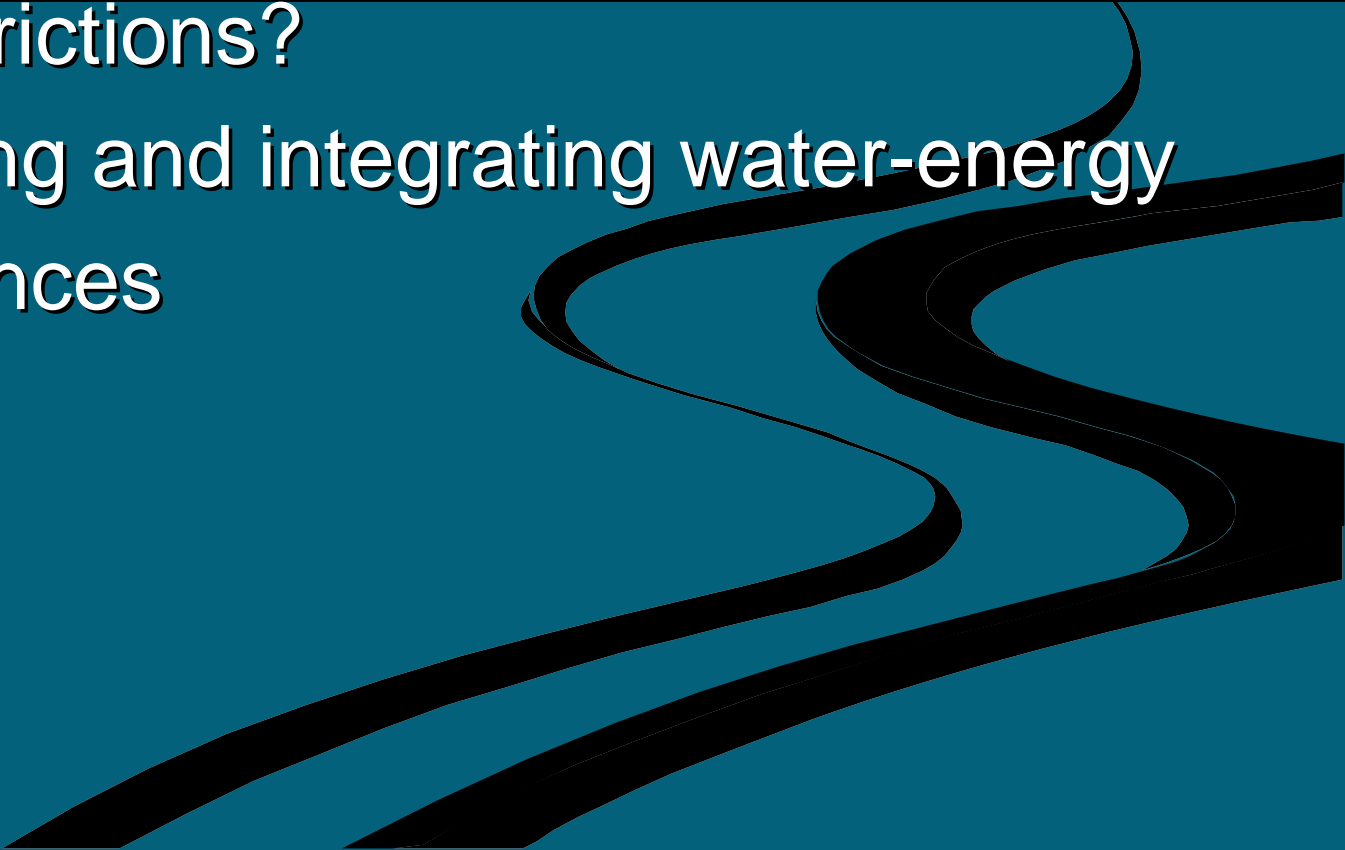
Urban WTP “down under” new cricket fields



What Do We Need to Get Better At Contingency Agreements?

- Urban areas: what's it really worth to avoid water restrictions?
 - Households WTP 10-20% more on water bill to avoid outdoor water use restrictions
 - Real costs of restrictions? Jobs? Property values? Community cohesion?
 - Fine tuning urban outdoor water use for private and public uses

What Do We Need to Get Better At Contingency Agreements?

- Ag crop cycles, seasonality, costs, returns
 - Urban areas: what's it really worth to avoid water restrictions?
 - Considering and integrating water-energy consequences
- 

Water-Energy Institutions of the Future

Authorized to act on regional scale

Representation of multiple jurisdictions and
interests

- too costly to remain fractured
- regional economy highly interdependent


Professional staff in water and energy fields

Pre-cursors: regional water banks, and
water and power authorities

Water-Energy Institutions of The Future

NIMBLE,

respond quickly
in changing
conditions



Water-Energy Institutions of The Future

NIMBLE,
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in changing
conditions

Thank you!

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